to Forage Crop Investigation files.

UNITED STATES DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN

Rev.ed. follows

WASHINGTON, D. C. 653 APRIL 7, 1915.

Contribution from the Office of Experiment Stations, A. C. True, Director.

HONEY AND ITS USES IN THE HOME.

By CAROLINE L. HUNT, *Expert in Nutrition*, and HELEN W. ATWATER, *Assistant in Nutrition, Office of Experiment Stations.*

INTRODUCTION.

In the days before trade with the Tropics introduced cane sugar into temperate regions honey was by far the most common sweet substance available for human food. In very early times men discovered that the material deposited by honeybees in hollow trees and in the crevices of rocks was a valuable and agreeable food and learned to appropriate it to their own use. Such wild honey is still gathered in Palestine and in the less advanced parts of Africa, in Asia, and in South and Central America, that from Peru making an important article of export. Bee trees, which were considered a prize in pioneer times in this country, are still valued in some remote rural regions, and not infrequently people living in country or village take the comb from a colony of bees which has settled in a corner under the weatherboarding of a building or some similar place.

The naturally built combs are of course very irregular, and this fact, combined with the difficulty of driving the bees out, is likely to cause great loss of honey and to injure the colony. The idea of getting bees to build their combs in some special and convenient place of man's providing—that is, in a hive—seems to have occurred very long ago to people almost everywhere, and the custom of "keeping" bees instead of seeking out their haunts was the first step toward securing a better and more economical supply of honey. Bee-keeping is now almost universal except in regions of extreme cold and among savage tribes.

The hive, once adopted, has undergone many changes, all of them intended to direct the activities of the bee to the service of man. Up to 60 or 70 years ago the hives most commonly in use among nations of European origin were the round and slightly pointed

NOTE.—This bulletin is of interest to housekeepers throughout the country.

80282°—Bull. 653—15——1

ones made of tightly braided straw or willow, which are known as skeps and which have become a generally recognized symbol of industry. In these the combs are built irregularly, and since they are fastened firmly to the top and sides they can not be handled separately. There is no provision for separating the brood cells where the bees rear their young from that extra supply of honey which they instinctively store in times when the nectar flows freely and which is the only part that can be used as food for man. The destruction of the colony at the time of taking the honey was formerly a common practice.

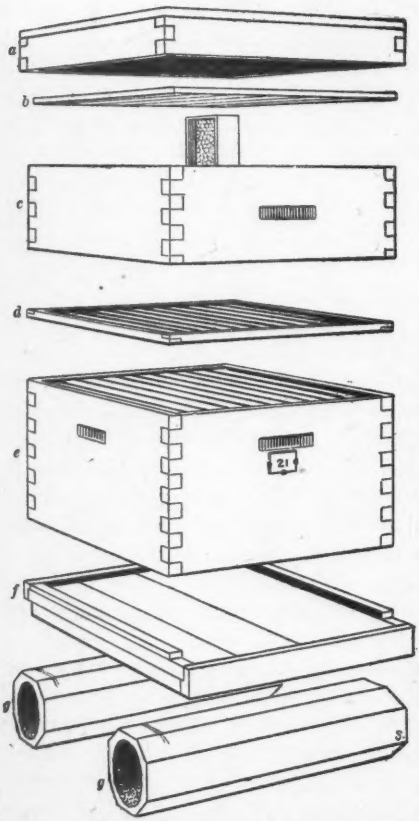


FIG. 1.—A 10-frame hive with comb-honey super and perforated zinc queen excluder. (From Phillips.) (*a*) Cover. (*b*) Inner cover. (*c*) Super. (*d*) Queen excluder. (*e*) Hive body for brood. (*f*) Bottom. (*gg*) Supports.

The hives now most commonly used in this country are of the type invented by Langstroth in 1851. They consist of rectangular wooden boxes or chests from the sides of which, at a point near the top, removable frames for the combs are suspended. One or more supers or extra parts of the hive are kept on hand, so that new ones can from time to time be placed on the part of the hive used for brood rearing, and thus the amount of honey-storing space can be enlarged when the bees are most active in gathering nectar. The modern hives are sometimes supplied with queen excluders, which permit only the worker bees, which are smaller than the queen, to pass from the lower hive body into the place reserved for the surplus honey, thus preventing the rearing of brood in the supers. There is also an arrangement by which all of the bees can be trapped, and thus kept out of the supers when the honey is to be removed. (See fig. 1.)

Not long after the introduction of Langstroth's hives gave an impetus to commercial beekeeping a centrifugal honey extractor was invented, which greatly improved the method of removing honey from the comb. Formerly honey was strained from the combs, and such honey was a rather uncertain product and often contained various kinds of refuse, such as parts of dead bees, etc., which could not be easily removed. When the modern centrifugal machines are used, the wax caps which close the cells of the combs are cut off, and the uncapped combs are put into the extractor, which throws the liquid honey out by centrifugal force and lets it run off at the bottom of the machine. Honey which has just been extracted may contain some pieces of wax capping and other impurities. Hence, extractors are usually provided with strainers which remove the larger particles as the honey passes out. The particles are lighter than honey. Honey is therefore usually allowed to stand until they rise to the top in scum, and the latter is removed before the honey is put into cans or bottles.

Because extracted honey is easily adulterated, the public was formerly rather suspicious of its purity. Recently, however, owing to pure-food legislation, to the watchfulness of the Bureau of Chemistry of the United States Department of Agriculture and State agencies charged with the carrying out of pure-food laws, and also to the efforts of honey producers, the practice of adulterating honey has become dangerous and unprofitable; confidence in the extracted article has been largely restored, and there is relatively little adulterated extracted honey on the market.

Although the greater part of the honey produced is now sold as extracted honey, there is still a good market for comb honey, and since appearance is an especially important feature in judging it, the producer takes special pains to have the combs regular in shape and attractive in color. Comb honey can not be adulterated except by processes which cost more than the retail price, and therefore the purchaser may be sure that comb honey is the product of the hive.

There are two kinds of natural honey, known as floral or normal, and honeydew or abnormal, the former being made from nectar, a sweet liquid secreted by flowers, and the latter from honeydew, a sweet substance deposited on the leaves of plants by plant lice and other insects. Unless otherwise stated, the term "honey" when used in this bulletin may be understood to refer to the kind made from nectar, or to that in which the quantity of honeydew is so small that it does not greatly affect the character of the product.

The chief materials that the worker bees bring to the hive are nectar, pollen, and propolis. They collect the pollen on the hairs on their bodies, place it in the so-called pollen baskets on their legs,

and thus carry it back to the hive to be deposited near the brood cells. This pollen is rich in nitrogenous material and is important as food for the young and developing bees (larvæ). A few grains usually find their way into the honey cells. Propolis or bee glue is obtained from the gums exuding from trees and shrubs. It is taken to the hive in the same way as pollen and is used to make the hive waterproof and sometimes to strengthen the edges of the comb. If any gets on the capping of the honey it tends to spoil the appearance of the combs; these traces of propolis are known as "travel stain."

Nectar is the material from which honey is made. The bees suck it out of the flower with their long tongues and swallow it into the honey sac where it undergoes some changes not yet well understood. It consists chiefly of sugar and water, the former constituting usually between one-fifth and two-fifths of the entire weight and the latter between three-fifths and four-fifths. With this substance are mixed small quantities of other materials, chiefly mineral matters, gums, and volatile bodies. To the latter the aroma and flavor of honey are chiefly due.

The changes by means of which nectar is transformed into the finished honey are technically known as "ripening." They take place partly in the honey sac of the bee, and partly in the cells of the comb, continuing even after the latter have been capped with wax. They consist mainly in removal of part of the water from the nectar, a task which the bees accomplish by warming the air of the hives and also by fanning the nectar in the cells, and in the change in the chemical nature of the sugars, which will be described later (see p. 5).

Wax is made in and secreted from special glands on the abdomen of the worker bee. Several pounds of honey are used in producing a pound of wax, and a high temperature must be kept up in the hive by the bees while it is being made. Because of the cost of wax secretion beekeepers usually try to arrange that the bees shall have little comb building to do except when comb honey is being produced.

FOOD VALUE OF HONEY.

Like most foods, honey, although preserving its general character, varies more or less from the average composition. The variations are of interest to the housekeeper in so far as they may affect the food value or the way in which the honey can be used to the best advantage in cookery. They may also be of decided interest to the food inspector, as departures from the usual composition may help him to detect the presence of adulterants.

So far as its food value is concerned honey may be roughly described as a sirup with a distinctive flavor and aroma made up of 4 parts sugar to 1 part water. There are several kinds of sugars present in honey, including cane sugar (sucrose), grape sugar

(dextrose), and fruit sugar (levulose); the last two together being called invert sugar. Some dextrin is also present as well as a variety of other substances in very small amounts. Included among them are nitrogenous substances (protein) which occur in quantities too minute to affect the food value of honey for man. Some of the other substances present in minute quantity, namely volatile oils, or other bodies of pronounced odor or flavor from the nectar, are valuable because they influence the flavor and aroma of the honey.

According to data gathered by the Bureau of Chemistry[1] honey, on an average, contains in round numbers per hundred parts 18 parts water, 78 parts carbohydrates (including 76 parts sugar and 2 parts dextrin), 0.2 part mineral substance, or ash, and nearly 4 parts of undetermined substances such as pollen grain, gum, bee glue, formic acid and volatile oils, and other flavor substances. These are average values and there is, of course, considerable variation in individual honeys. For instance, the proportion of water varies from about one-eighth to one-fourth of the total weight of the honey, being influenced by the moisture in the air at the time the honey is produced and the dryness of the atmosphere in which the honey is kept afterwards. Samples of honey from conspicuously dry localities (the southwestern part of the United States, for instance) and honeys made in other localities in very dry weather have a relatively low water content.

The most abundant of the mineral substances in honey are magnesia, lime, phosphoric acid, and iron. Since honey contains less than 1 part per hundred of mineral matter, it is obvious that even if eaten in large amounts it could not contribute greatly to the total mineral matter of the diet. However, it is claimed that unless care is taken in selecting foods there is a possibility that the diet may contain too little lime, and for this reason it is worth noting that honey contains this constituent. In respect to its ash content it is more comparable with maple sirup than with cane sugar from which the mineral substances originally present in the plant juices have been removed during the process of refining.

The percentage of the different sugars varies more or less, but under any circumstance the amount of cane sugar is small (some 2 parts per hundred) and less than in the nectar from which the honey is made. The proportion of dextrose (grape sugar) and levulose (fruit sugar) making up the total invert sugar varies in honey as it does in the nectar from which it is made, but this is of no importance in planning meals. However, it is of practical importance for the reason that it determines the character and appearance of the honey. Honey will granulate easily if the proportion of dextrose is large, but this is

[1] U. S. Dept. Agr., Bur. Chem. Bul. 110.

not the case if levulose predominates. For example, alfalfa honey which contains a high percentage of dextrose often forms such a solid mass of crystals that it is sold in cakes. This may be an advantage sometimes. Thus, the solid alfalfa honey can be used for such purposes as filling for layer cakes, for which liquid honey would not be so suitable because it would run out. The proportion of dextrin present in normal or nectar honey is so small that it affects neither food nor cooking values. Abnormal or honeydew honey, however, contains so much dextrin that it requires special handling in cooking. This is a matter of interest to professional bakers rather than to housekeepers, as such honey is not commonly used in the home.

Since the principal ingredient of honey is sugar, it is obvious that it should be classed with the fuel foods which supply the body with the energy it needs for the various tasks it performs rather than those whose function is to build and repair the body—that is, the "tissue formers," as they are sometimes called. If honey contained no water its energy value would be practically the same, pound for pound, as that of cane sugar. However, since about one-fifth of its total weight is water, it follows naturally that its energy value is one-fifth less than that of cane sugar, being 1,485 calories per pound.

In planning meals, particularly in hospitals, children's homes and other institutions where large quantities are required, it is often convenient to have some quick and fairly accurate method of estimating the relative value of different articles of diet which are used in similar ways. For this reason it is worth remembering that an ordinary tablespoonful of honey which weighs a trifle over an ounce will furnish the body 100 calories. The same amount of energy would be supplied by five-sixths of an ounce of sugar, by 1¼ ounces of molasses, or by a little less than an ounce of preserves (such as orange marmalade).

FLAVOR OF HONEY.

The flavor and aroma of honey depend largely upon the blossoms from which the nectar is obtained. The nectar of each kind of flower contains a distinctive combination of oils and other substances which gives the blossoms their special fragrance, and these substances are retained in the honey made from the nectar. It is practically impossible to prevent bees from visiting more than one kind of flower during a given period, and, strictly speaking, almost every kind of honey is made from a mixture of different nectars. Nevertheless, when the hives are situated near a large supply of one sort of blossom, its nectar usually predominates and its flavor and aroma can be easily recognized in the honey. It is perfectly correct, therefore, to speak of basswood honey, fruit-blossom honey, buckwheat honey, etc.

Different localities naturally produce different kinds of honey, and different kinds may be produced in the same locality at different seasons, according to the kinds of flowers which abound. Several famous European honeys, among them the choice French variety from Narbonne, owe their characteristic aromatic flavor to wild thyme and other flowers of the mint family. In orange honey from districts where orange blossoms abound the peculiar aroma and flavor of the flowers are very clearly marked. Sage and clover honeys are well-known American varieties in which the characteristics of the nectar are easily and pleasantly recognized.

Choosing between honey from different flowers is mainly a matter of taste; and taste in honey, as in many other things, seems to depend more on what one has been accustomed to than on any real superiority. For example, it sometimes happens that a person who has always used buckwheat honey with its full-bodied, rather acid flavor, imagines that a mild, light honey with less of the characteristic "comby" taste must be adulterated, whereas a person who is familiar only with some such delicate honey as white clover or alfalfa may consider buckwheat very inferior, or even fancy that it is not genuine floral honey.

The relative abundance of different flowers and consequently the flavor of the honey vary so greatly in different seasons that beekeepers can not count on a regular yield of uniform honey, and their patrons may be disappointed to find that the honey of one year is different from that of the year before. To overcome this difficulty many of the best wholesale dealers have recently adopted the practice of mixing several honeys to produce a blend. This process is like that adopted long ago in the case of teas. To blend honeys so that the mixture will be generally acceptable requires a great deal of skill, but when the consumer has found a blend which pleases him, he is more likely to be able to get honey of that flavor season after season than if he depends on unmixed honeys.

WHOLESOMENESS.

Because the chemical change effected by the bee in the sugars of the nectar is the same as that effected by digestive ferments, and the principal sugars may therefore be considered to have undergone the first step of digestion, honey is often said to contain predigested sugar, and to be more wholesome than cane sugar. There is no reason, however, to believe that the healthy human body is not equal to the task of digesting any sugar, so a special claim made for the wholesomeness of honey on this ground seems unimportant. It is generally believed that the energy from sugar is liberated for the use of the body more quickly than that from such other fuel foods as

starch and fat. Hence it is said to delay the oncoming of fatigue during great muscular exertion. For this reason some form of sweet is included in almost all army rations and is often used by persons undergoing severe physical exertion, such as mountaineers and athletes. Although no experiments have been made to test the value of honey in this respect, it seems safe to suppose that it would have the same good effect as other sweets.

Everyone knows that eating too much ordinary sugar upsets digestion. The differences in the effects of too much honey and too much cane sugar are rather complicated, but it is safe to say that eating too much of either should be avoided, even by healthy people.

For some persons suffering from serious digestive disturbance honey may be a safer form of sugar than cane sugar, but with other forms of indigestion the opposite is true; it depends upon the particular form of disturbance, and such matters should be decided by a skillful physician for each individual case. For persons of very delicate digestion the particles of wax in comb honey may cause trouble, as it is believed that the digestive processes do not have any effect on them. For normal persons, however, the wax should be as harmless as are the particles of indigestible material contained in many other wholesome foods.

Honey is sometimes said to have a mildly laxative effect, and the statement is doubtless true, as it is of many other food materials, especially those of vegetable origin. If a person had to live on a very limited number of foods, especially if he had a tendency to constipation, it might be wise to use honey rather generally in preference to other forms of sweet; but the effect of such small amounts of honey as would be used in an ordinary diet would hardly be worth taking into consideration. Bran biscuits made with honey instead of sugar (see p. 16) would owe any advantage they might have over the ordinary bran biscuit to the laxative effect of the honey.

Other medicinal qualities have been claimed for honey, particularly in older writings, and it still finds use in medicinal preparations, but no doubt more because of tradition and of the flavor and texture it imparts than for actual medicinal properties. From the standpoint of the honey industry this is a matter of little importance, for honey is regarded by the vast majority of its users as a food and not as a drug product.

Even if honey has no such specific medicinal advantages, this does not in the least lessen its general value as a wholesome, useful foodstuff, well worthy of even more extended use than it already has, not only because it is agreeable and economical in itself, but also because it introduces a pleasing variety and thus makes the diet more appetizing, and consequently more wholesome.

ECONOMY OF HONEY AS FOOD.

Whether or not honey can be economically used in the diet as a source of nourishment depends of course upon its food value and its price as compared with other food for which it may be substituted. To compare food materials in these two respects is no easy task because, besides varying in price with time and place, they may differ widely in the kind and the quantity of the nutrients which they supply. If honey is compared with cane sugar at 7 cents a pound on the basis of the energy which it provides for the body, it should sell for not more than 6 cents a pound in order to be as economical. Comparing it on the same basis with butter at 40 cents a pound, it is evident that it might sell for 17 cents a pound and be equally economical as a source of energy.

The differences between the wholesale prices of comb honey and of extracted honey are much greater than those between the retail prices. A pound of extracted honey in a jar usually sells at retail for about the same as the average section of comb honey, which has a net weight of 14 ounces. On the other hand, the wholesale price of comb honey is usually about 50 per cent higher than that of extracted honey. The reason for this is that the producer of comb honey does far more of the work of getting his product ready for the final market than does the producer of extracted honey. As the sections leave his hands so they are passed over the counter to the housewife or other retail purchaser. Extracted honey, on the contrary, is sold by the producer to the bottler, not in pound lots but in 5-gallon cans or barrels. The bottler does the work of blending, liquefying, bottling, labeling, and packing. It is possible, therefore, for the consumer to save money by buying extracted honey at wholesale and avoiding the cost of the various kinds of work which prepare it for the retail market.

Where only small quantities of honey are used, the effort to buy in the cheapest market may cost more in energy than it saves in money. Where, however, large supplies are bought, the purchaser should try to get into direct communication with the producer and take advantage of the parcels post as a means of transportation. The names of dealers in his vicinity can often be obtained from the bee-keepers' magazines, or by writing to the State inspector of apiaries. The names of State inspectors and often those of local dealers can be obtained by addressing the Bureau of Entomology of the United States Department of Agriculture.

Now that extracted honey is usually pure and of good quality, the advantage of comb honey lies chiefly in its attractiveness to the eye. Unless very great care is taken in extracting honey, some of the

volatile bodies on which its flavor depends will probably be lost. Hence it often happens that the flavor of comb honey is really slightly superior to the same kind extracted. Many persons think that the presence of the wax gives the honey a more pleasant consistency for table use. Whether these advantages are worth the extra cost each consumer must decide for himself.

Comb honey is commonly graded according to finish and color. It is described as Extra Fancy, Fancy, No. 1, or No. 2, according to the evenness with which the sections are filled, the freedom of the product from propolis or other stains, and the number of unsealed cells. It is graded according to color as white, light amber, amber, and dark. From the point of view of food value alone, finish and color are not of importance, though dark honeys are usually of stronger flavor.

In order to comply with the Federal Food and Drugs Act which applies to all goods shipped from one State to another, every section of honey and every package containing extracted honey must be marked with the net weight. In comb honey this is understood to be the weight of the comb and the honey and to exclude the weight of the wooden frame.

In choosing honey too much importance should not be attached to lightness of color, for some of the best varieties are dark; nor should granulation be thought to imply adulteration. The truth is that crystallization is more likely to occur in pure than in impure honeys, and some pure varieties, especially alfalfa honeys, granulate so easily that they are often sold to the consumer in solid form. The crystals can easily be dissolved by heating the honey, which should be done in a double boiler or other kind of water bath. If the temperature does not go beyond 160° Fahrenheit, there is little danger that either color or flavor will be affected.

Unless in a sealed package, honey should be kept in a dry place; otherwise it is likely to absorb moisture and spoil, for when dilute it will ferment or sour readily, as will any other similar sugar sirup. Heat and dryness are usually found together in the household, and ordinarily the safest places for honey are the warmest places; the least desirable is the refrigerator.

USES OF HONEY.

Honey is used both in its natural state and as an ingredient of cooked food. In this country it is more commonly used uncooked than cooked, and practically all comb honey is consumed in this way. Honey is much more commonly used in cookery in Europe than in America, though commercial bakers and confectioners in the United States use much larger quantities than many persons realize.

The simplest way of using honey is to serve it like jam or sirup with bread, breakfast cereals, boiled rice, pancakes, and other mild-

flavored foods. As ordinarily used on bread, an ounce of honey "spreads" as many slices as an ounce of jam. When it is to be used in the place of sirup some people dilute it by mixing it with hot water, which has the effect of making it not only less sweet but also easier to pour.

Honey or a mixture of honey and sugar sirup can be satisfactorily used for sweetening lemonade and other fruit drinks. Sirup of any kind is more convenient for this purpose than undissolved sugar, and when charged water is to be added it has a further advantage since it has less tendency to expel the gas. It is the custom of many housewives to keep a sirup for this purpose, particularly in hot weather, and variety can be secured by occasionally using honey.

Honey can be used in place of sugar for some kinds of preserving, and there is reason to believe that fruits cooked in it keep very well indeed. Bar-le-Duc currants, which form a very delicate and expensive article of commerce, are often made by cooking currants in honey. They are frequently served with cream cheese and crackers or other form of bread. A satisfactory substitute may be secured by serving honey and tart fruit, either cooked or uncooked, with cottage cheese and bread and butter. Three ounces of cottage cheese curd, two ounces of bread, two-thirds ounce of butter (either added to the curd or spread on the bread), two ounces of honey, and six ounces of strawberries or other watery fruit would make a reasonably well-balanced meal. Sometimes honey alone is served with cream cheese. Crisp crackers, spread with cream cheese and honey, form a good combination from the point of view of nutritive value and taste. Honey may be substituted for sugar in baking apples.

HONEY IN COOKERY.

When used in cookery honey does not always produce the same effect as corresponding quantities of sugar or molasses, and the reasons for some of the differences between them are not well understood. Careful experiments with various types of honeys and honey recipes were therefore made in the nutrition laboratory of the United States Department of Agriculture, in the hope of explaining such points. Most of the facts stated in the following paragraphs were obtained in this way, and all the recipes (pp. 15–26) were tested there.

The fact that honey consists principally of sugar and water and is slightly acid suggests that it is a suitable substitute for molasses in cookery. As a matter of fact, it can be used in the place of molasses in all forms of breads, muffins, and cakes, and makes a more delicately flavored product. It contains less acid than molasses, however, and so requires less soda when it is substituted for molasses in recipes which do not include sour milk or other acid, and the cook

must be careful about the amount of soda used. Many trials were made with different kinds of honey in this laboratory which showed that the allowance of soda to a cupful of honey very generally ranges between one-fourth and one-half of a level teaspoonful. Unless the cook is thoroughly familiar with her honey, she would do well to mix and bake a small sample of dough before she decides on the amount of soda to be put into the main portion.

When honey is to be substituted for common sugar it is desirable to know not only how it compares in sweetness, but also how much allowance must be made for the water which it contains. Assuming a cupful of good honey to measure one-half pint, it should weigh about 12 ounces. Of this, 9 to 10 ounces, roughly speaking, is sugar. A cupful of honey, therefore, corresponds to a little more than a cupful of cane sugar. Hence it is safe to estimate that a cupful of honey will sweeten a dish just about as much as a cupful of sugar. Besides the sugars, there is about one-fifth of a cupful of water in a cupful of honey. Theoretically, therefore, in making cake one should substitute honey for sugar cupful for cupful, and for each cupful of honey use one-fifth cupful less of the milk or other liquid which the recipe calls for. For practical purposes, however, it is accurate enough to consider that the water in a cupful of honey is one-fourth of a cupful. This rule was found to hold good with a large number of ordinary cake recipes which were tested in this laboratory. These facts, if kept in mind, make special honey recipes unnecessary and enable the cook with very slight calculation to modify ordinary ones so that honey can be used in place of sugar. Besides slightly changing the flavor of the cake, honey used in the place of sugar makes it keep moist longer. A honey cake made with butter will keep its quality until the butter grows rancid, and one made without butter will keep fresh for months and even improve in flavor. What is true of the cakes is also true of the dough; it can be kept almost indefinitely. Evidently, then, honey is especially useful in recipes without butter. For this reason, most of the honey cakes experimentally studied in this laboratory were made according to the following formula which is typical of Honig Kuchen, or German Christmas cake: Three-fourths cup honey, one-half cup sugar, two cups or more flour, one-fourth teaspoon powdered ginger, one-half teaspoon powdered cardamom seed, one teaspoon cinnamon, one-eighth teaspoon cloves, a speck white pepper, a pinch salt, one-fourth to one-half teaspoon soda, one tablespoon water, and two ounces blanched almonds cut in small pieces or chopped.

The directions for making the honey cakes, not only in the older cookbooks, but also in many modern bakers' manuals, are extremely elaborate; one of the purposes of the experiments made in this

laboratory was to determine how many of the suggested precautions are necessary.

Recipes usually direct that the honey be brought to the boiling point and then skimmed and cooled. This must be done with great care, for the honey is very likely to boil over. Experiments with a large variety of honeys such as are ordinarily purchased in the United States for household use, showed that nothing rises to the top during the boiling which can not be easily stirred back into the liquid. It seems likely therefore that the custom of boiling had its origin at the time when honey, or at least the grades bakers use, was much less carefully prepared than at present and contained impurities of many kinds. A cake made by stirring flour directly into cold honey was found to be in no way inferior to those made with honey which had been heated.

Some recipes found in the older cook books, particularly those of foreign origin, direct that the spices be boiled with the honey and give as a reason for this that the heating brings out their flavor and makes them "go further." The weight of this argument is obviously difficult to determine, but the work carried out in the Nutrition Laboratory gave no evidence that the short heating at the beginning is of special importance in comparison with the long heating which the materials must receive while the cake is being baked.

The older recipes almost invariably direct that the dough be kept for a certain length of time, sometimes one day, sometimes more, before the soda is added. So reliable an authority as König says that this is because, owing to the presence of bacteria, the acidity of the mixture increases with time, and that therefore more soda can be used after the dough has stood. To test this point, dough was mixed in this laboratory and analyzed by the Bureau of Chemistry; it was found to have 0.0775 per cent of acidity immediately after being mixed, and 0.1 per cent after four days' time. Another sample increased in six days from 0.108 per cent to 0.117 per cent, and during the following six days to 0.125 per cent. It seems probable, therefore, that the acid does usually increase; but even so, the question arises whether there is not in the beginning enough acid to act on soda sufficient to raise the cake. In order to determine this, two samples of dough were mixed. To No. 1 the soda was added at once and baking followed immediately. No. 2 was kept for a week, when the soda was added and the cake was baked. The second was neither lighter nor in any way superior to the first.

It is frequently stated that the dough can be more easily kneaded if it is allowed to stand several days. In order to test this point, a dough was mixed which was stiff enough to hold its shape, but which stuck to the hands and the molding board. After a week's time it

could be molded freely on an unfloured board without sticking to it. This argument for keeping the dough seems therefore to be sound.

It is sometimes said that the reason why cakes made with honey keep soft for a long time is that they absorb moisture from the air. To test this point a cake made according to the recipe already given was weighed at different intervals during 7½ months. The weight of the dough was 526 grams, the weight of the cake on the day of baking, April 17, 1913, was 499 grams after it had been removed from the pan, and at the final weighing on December 2 of the same year, it weighed 469.7 grams. The loss of weight was continuous during all this time, with the exception that in the late summer there was a slight increase in the weight, probably due to unusual dampness of the air; this was followed by a relatively great loss. On December 2, when the cake was cut, it was in good condition, and had a fine flavor and the consistency of a soft cooky. The experiment was repeated with small honey cakes, and these also showed no increase in weight before softening. While these experiments are not sufficient for definite conclusions, they indicate that the increased softness of the honey cake is not due to the absorption of water.

Icing made with honey or with part honey and part sugar according to the recipe on page 25 has the same advantage that honey cakes have. Such icing made in this laboratory was found at the end of 10 months to be soft and in as good condition as when originally made. It would, therefore, seem to be suitable for cakes that are to be kept for a long time.

In most of the recipes in foreign cookbooks "potash" (potassium bicarbonate) is recommended for use with honey to raise the dough. This is very similar in its properties to ordinary baking soda (sodium bicarbonate) and seems to have no advantage over it for this purpose. Whatever may have been the conditions in earlier times in Europe, baking soda is a common kitchen commodity in most American homes, and the potassium bicarbonate is almost unknown for household purposes. Both the potassium bicarbonate and baking soda gave much better results in the honey recipes tested than did the baking powder, and naturally, since the acid honey calls for an alkali like soda rather than a mixture of acid and alkali such as baking powder. If baking powder were used it should be in addition to soda enough to neutralize the acid of the honey, not merely as a substitute for soda, just as housekeepers sometimes neutralize sour milk or molasses with soda and then add baking powder to raise the dough.

In the countries where honey cakes have come to perfection spices are used which are somewhat uncommon in this country, and it is reasonable to suppose that long experience has taught a good com-

bination of flavors. Cardamom seed, a rather old-fashioned flavor which is still sometimes found in candies, seems to combine more satisfactorily with the flavor of honey than some of the spices which are better known in our kitchens. It is best, however, to use it in combination with other flavoring materials. The following has been found to be a good combination:

Salt, 1 part by measure.
White pepper, 1 part.
Nutmeg, 2 parts.
Cloves, 2 parts.
Ginger, 4 parts.
Cardamom, 8 parts.
Cinnamon, 16 parts.

These should be thoroughly mixed and can be made up in quantity and kept ready for use.

Aniseed and coriander seed are also often used in honey cakes in combination with other spices. The following mixture is recommended in a baker's handbook,[1] the amounts given being suitable for 10 pounds of dough:

2 ounces ground cinnamon.
½ ounce ground cloves.
2 ounces aniseed.
1 ounce finely ground coriander seed.

In considering the uses of honey in cookery, it is well to remember that it owes its flavor to bodies which are very volatile and that for this reason it should not be heated unnecessarily hot or unnecessarily long.

In order to learn how honey is used in cookery, standard cookbooks from many countries were examined and many persons familiar with honey cookery were consulted. Innumerable as the recipes were, it was soon found that they belonged mainly to only a few different types, such as breads made with honey, honey cakes made with or without butter, fruits preserved in honey, and sauces and candies made with honey. Many recipes were tested in this laboratory, and some of the more desirable ones were adapted for use in the United States and are published here.

BREAD AND MUFFINS.

Honey is not often used in bread making but there is no reason why it may not be used in yeast bread as food for the yeast plant or be substituted for molasses or sugar in varieties of bread which call for such sweetening. A few recipes are here given.

Bran Brown Bread.

1 cup white or whole wheat flour.
1 teaspoon soda.
½ teaspoon salt.
1 cup bran.
½ cup honey.
1 cup sour milk.
½ cup raisins floured.

[1] The Twentieth Century Book for the Progressive Baker. By F. L. Gienandt. Boston, 1913, p. 129.

Sift together the flour, soda, and salt, and add the other ingredients. Steam three hours or bake 40 minutes in a slow oven. If the amount of milk is increased by half, the bread is more delicate and has a somewhat higher food value.

Steamed Brown Bread.

1 cup yellow corn meal.
2 cups graham flour.
⅔ cup honey.
2 cups sour milk.
1 teaspoon salt.
1½ teaspoons soda.
1 tablespoon boiling water.
1 cup seeded raisins.

Mix together the meal, flour, and salt; add the sour milk and the honey and then the soda dissolved in the boiling water; and the raisins. Steam three hours in covered receptacles, which should be not more than two-thirds full at the beginning of the cooking.

Honey Bread.

2 cups honey.
4 cups rye flour.
1 teaspoon soda.
4 teaspoons aniseed.
2 teaspoons ginger.
4 teaspoons powered cardamom seed.
2 egg yolks.
½ cup brown sugar.

Sift the flour with the spices and soda and add the other ingredients. Put the dough into shallow buttered pans to the depth of about an inch and bake in a hot oven.

Honey and Nut Bran Muffins.

½ cup honey.
1 cup flour.
½ to ¾ teaspoon soda.
½ teaspoon salt.
2 cups bran.
1 tablespoon melted butter.
1½ cups milk.
¾ cup finely chopped English walnuts.

Sift together the flour, soda, and salt, and mix them with the bran. Add the other ingredients and bake for 25 or 30 minutes in a hot oven in gem tins. This will make about 16 large muffins, each of which may be considered roughly to be a 100-calorie portion and to contain 2 grams of protein.

Honey and Nut Sandwiches.

Mix the honey with pecan meats or almonds minced, and make into sandwiches with small baking-powder biscuits.

Honey and Cream Cheese Sandwiches.

Mix honey with cream cheese and use as filling for bread or baking-powder biscuit sandwiches. Chopped nut may be added to the honey and cheese if desired.

CAKES, COOKIES, ETC.

By far the most general use of honey in cookery is for cakes. Of these there is an almost endless variety, from rich fruit cake in loaves or elaborate pastries with honey filling to simple cookies. As has been pointed out, the honey flavor combines especially well with spices. The presence of honey also makes the cakes keep fresh longer. These two facts probably explain why the honey cakes, which belong mainly to the general order of gingerbreads or spice

cakes, are so largely produced by commercial bakers. Many of these are rather elaborate to make, and for that reason some of the simpler kinds of honey cakes may be preferred by the busy housekeeper.

Hard Honey Cake.

¾ cup honey.
½ cup sugar.
2½ cups flour.
1 egg.
½ teaspoon ginger.
1 teaspoon cinnamon.
½ teaspoon ground cardamom seed.
½ teaspoon cloves.
Speck white pepper.
Speck salt.
½ teaspoon soda.
1 tablespoon water.
2 ounces blanched almonds cut into small pieces or chopped.

Sift together the flour and spices, dissolve the soda in the water, beat the egg and combine all the ingredients. Beat or knead the mixture thoroughly. Cook a small sample. If it does not rise sufficiently, add a little more soda and honey; if it falls, add a little more flour. Roll out the dough to the thickness of about three-fourths of an inch and bake in a hot oven. When the cake is done glaze it with a thick sirup of sugar and water and allow it to dry in a slow oven or in some other warm place. While it is still warm, cut it into long strips. Or it may be left in one large cake, to be cut into very thin slices when served. This cake will become very hard on cooling and will not be soft enough to eat for several weeks, but will keep in good condition for an indefinite length of time.

Butter Honey Cake.

1½ cups honey.
½ cup butter.
3 egg yolks.
5 cups flour.
2 teaspoons ground cinnamon.
½ teaspoon salt.
1½ teaspoons soda.
2 tablespoons orange-flower water (water may be substituted).
Whites 3 eggs.

Rub together the honey and butter; add the unbeaten yolks and beat thoroughly. Add the flour sifted with the cinnamon and the salt; and the soda dissolved in the orange-flower water. Beat the mixture thoroughly and add the well-beaten whites of the eggs. Bake in shallow tins and cover with frosting made as follows:

Orange frosting for butter honey cake.

Grated rind 1 orange.
1 teaspoon lemon juice.
1 tablespoon orange juice.
1 egg yolk.
Confectioners' sugar.

Mix all ingredients but the sugar and allow the mixture to stand for an hour. Strain and add confectioners' sugar until the frosting is sufficiently thick to be spread on the cake.

For the cinnamon in the Butter Honey Cake the following mixture of spices may be substituted:

½ teaspoon ginger.
2 teaspoons cinnamon.
1 teaspoon ground cardamom seed.
1 teaspoon cloves.
¼ teaspoon nutmeg.
¼ teaspoon white pepper.
Chopped citron or nuts may also be added.

This mixture may also be flavored with ginger, aniseed, or cardamom seed.

Butter Honey Cake No. 2.

1 cup honey.
½ cup butter.
½ teaspoon ginger.
½ teaspoon cinnamon.
1 teaspoon ground cardamom seed.
3 eggs.
3 cups flour.
½ to 1 teaspoon soda.
1 ounce candied orange peel.
1 ounce candied lemon peel, or
1 cup seeded raisins.

Mix the honey and butter by warming slightly and stirring; add the spices and the yolks of the eggs unbeaten and beat the mixture thoroughly. Add the flour and the soda dissolved in a little water, then the whites of the eggs beaten stiff, and finally the fruit. Bake in a moderate oven.

Nut Honey Cake.

2 cups brown sugar.
2 cups honey.
6 egg yolks.
3 cups flour.
Speck of salt.
1½ teaspoons soda.
3 teaspoons ground cinnamon.
½ teaspoon ground cloves.
½ teaspoon ground nutmeg.
½ teaspoon allspice.
1 cup chopped raisins.
½ ounce citron cut in small pieces.
½ ounce candied orange peel cut in small pieces.
½ pound almonds coarsely chopped.
Whites of 3 eggs.

Mix the sugar, honey, and the yolks of the eggs, and beat thoroughly. Sift together the flour, salt, spices, and soda. Combine all ingredients but the whites of the eggs. Beat the whites of the eggs till they are stiff and add them last. Pour the dough to the depth of about half an inch into well-buttered tins, and bake in a slow oven for one-half hour.

Frosting for nut honey cake.

1½ cups sugar.
3 egg whites.
¾ cup water.

Boil the sugar and water until the sirup forms a thread when dropped from the spoon. While still hot, pour the sirup over the well-beaten whites of the eggs, beating the mixture until it is of the right consistency to spread.

Chocolate Nut Honey Cake.

To the above cake add 3 ounces of chocolate grated.

Soft Honey Cake.

½ cup butter.
1 cup honey.
1 egg.
½ cup sour milk.
1 teaspoon soda.
½ teaspoon cinnamon.
½ teaspoon ginger.
4 cups flour.

Rub the butter and honey together; add the egg well beaten, then the sour milk and the flour sifted with the soda and spices. Bake in a shallow pan.

Honey Sponge Cake.

½ cup sugar.
½ cup honey.
4 eggs.
1 cup sifted flour.

Mix the sugar and honey and boil until the sirup will spin a thread when dropped from the spoon. Pour the sirup over the yokes of the eggs which have been beaten

until light. Beat this mixture until cold; then add the flour, and cut and fold the beaten whites of the eggs into the mixture. Bake for 40 or 50 minutes in a pan lined with buttered paper, in a slow oven.

This cake can be made with a cupful of unheated honey in place of the honey and sugar sirup, but the quality is not quite so good.

Honey Pound Cake.

A good pound cake can be made by using equal weights of honey, sugar, eggs, flour, and butter. A little soda should be added because of the acidity of the honey, and a good flavoring is cardamom seed and orange-flower water. Or a cake similar to pound cake may be made as follows:

1 cup sugar.
¾ cup honey.
1 cup butter.
4 eggs.
2 cups pastry flour.
½ teaspoon powdered cardamom seed.
½ teaspoon soda.
½ teaspoon orange-flower water.

Rub together the butter and sugar, and add the honey. Add the yolks of the eggs well beaten. Finally, add the whites of the eggs, beaten to a stiff froth, and the orange-flower water. Add gradually the flour sifted with the soda and cardamom seed. Beat the mixture for 10 minutes. Put the dough into a warm tin with high sides, and bake in a slow oven one hour.

Ribbon Cake.

UTILIZING CANDIED HONEY AS FILLING.

½ cup butter.
2 cups sugar.
4 eggs.
1 cup milk.
3½ cups flour.
5 teaspoons baking powder.
1½ teaspoons ground cardamom seed.
1½ teaspoons ginger.
¾ teaspoon cinnamon.
¼ teaspoon cloves.
½ cup raisins, seeded and cut in pieces.
½ cup figs, finely chopped.
1 tablespoon honey.

Rub the butter and sugar together and add the yolks of the eggs. Sift together the flour and baking powder and add them to the mixture, alternating them with the milk. Finally, add the whites of the eggs well beaten. Bake two-thirds of the mixture in two layer-cake pans. To the remainder add spices, fruit, and honey, and bake in a layer-cake pan. Put layers together with crystallized honey.

Honey Fruit Cake.

3 cups flour.
2 teaspoons soda.
3½ cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed.
½ teaspoon cloves.
3 pounds raisins (seeded).
1½ pounds currants.
1 pound citron.
1 pound candied cherries.
1 pound candied apricots.
1 pound candied pineapple.
½ cup sour jelly, or
½ cup white grape juice.
2 teaspoons vanilla.
2 ounces candied orange peel.
2 ounces candied lemon peel.

Cut the candied fruit into small pieces, with the exception of the cherries, which should be left whole. Place the fruit in a large dish and sift over it one-half of the flour, mixing thoroughly. Sift the soda with the remainder of the flour. Bring the honey and the butter to boiling point and while still hot add the spices. When the mixture is cool, add the well-beaten yolks of the eggs, then the flour and grape juice or jelly and the well-beaten whites. Finally, add the fruit. The cake should be divided into three or four parts and put into buttered dishes covered with buttered paper tied closely over the tops. Steam for five hours, remove the paper, and bake in a very slow oven for an hour. This makes a very rich cake consisting chiefly of fruit. For the sake of economy, the flour can be increased to even twice the quantity without affecting the quality very much.

Honey Fruit Cake No. 2.

4 cups flour.
3 teaspoons soda.
2 cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed.
½ teaspoon cloves.
3 pound raisins (seeded).
4 ounces citron.
1 pound cranberries.
1 pound canned pineapple.
1 pound dried apricots.
1 pound dried apples.

To prepare the cranberries, pineapples, apricots, and apples, cook each in honey till it is soft; remove from the honey and dry in a very slow oven. A little water should be added to the honey in which the cranberries are cooked, a good proportion of ingredients being equal weights of cranberries, water, and honey. To any honey left over from cooking the fruits add enough honey to make up the total amount called for by the recipe. Mix and cook the cake in the same manner as honey fruit cake No. 1.

Honey Drop Cakes.

¾ cup honey.
¼ cup butter.
½ teaspoon cinnamon.
⅛ teaspoon cloves.
1 egg.
1½ to 2 cups flour.
½ teaspoon soda.
2 tablespoons water.
1 cup raisins, cut into small pieces.

Heat the honey and butter until the butter melts. While the mixture is warm add the spices. When it is cold add part of the flour, the egg well beaten, the soda dissolved in the water, and the raisins. Add enough more flour to make a dough that will hold its shape. Drop by spoonfuls on a buttered tin and bake in a moderate oven.

Yellow Honey Cake.

½ cup sugar.
2 egg yolks.
⅔ cup honey.
½ teaspoon cinnamon.
⅛ teaspoon cloves.
1½ cups flour.

Sift together the flour and the spices. Mix the sugar and egg yolks, add the honey, and then the flour gradually. Roll out thin, moisten the surface with egg white, and mark into small squares. Bake in a moderate oven.

Honey Cookies No. 1.

- ⅔ cup honey.
- ⅔ cup sugar.
- 2½ cups flour.
- ½ teaspoon soda.
- 1½ teaspoons cinnamon.
- 1 teaspoon cloves.
- 1 teaspoon allspice.
- 2 ounces finely chopped candied orange peel.
- ¼ pound walnut meats finely chopped.

Sift together the flour, spices, and soda, and add the other ingredients. Knead thoroughly, roll out thin, and cut with a biscuit cutter. These cookies are very hard.

Honey Cookies No. 2.

- ¾ cup honey.
- ⅔ cup sugar.
- ½ cup milk.
- 3 tablespoons lard.
- 2 egg yolks.
- 4 cups flour.
- ½ teaspoon salt.
- 1 teaspoon ground cinnamon.
- ½ cup finely chopped almonds.
- ½ teaspoon soda or 2 teaspoons baking powder.

Bring the first four ingredients to the boiling point and allow the mixture to cool. Sift together the flour, cinnamon, and soda or baking powder. Combine all the ingredients. Roll the mixture out thin on a floured board. Cut out and bake in a moderate oven on tins which have been greased and floured. To prepare the tins properly, brush them over with melted butter and sifted flour, turn them over, and shake off as much as possible of the flour.

Honey Cookies No. 3.

- ¼ cup water.
- 1 pound brown sugar or 2 cups packed solidly.
- ½ cup lard.
- 1 cup honey.
- ⅓ cup egg yolks.
- 1 teaspoon soda.
- 6 cups flour.
- 1 teaspoon powdered cardamom seed.
- 1 teaspoon cinnamon.

Heat the water, sugar, lard, and honey until the lard is melted. When cool, add the yolks of the eggs and the flour, sifted with the soda, and spices. Roll out on a floured board and cut into any desired shape. Place a small piece of citron in the middle of each cooky.

Honey Bran Cookies No. 1.

- 2 tablespoons butter.
- ½ cup honey.
- 2 eggs.
- ¼ to ½ teaspoon soda.
- ½ cup flour.
- 1 cup bran.
- ⅛ teaspoon powdered aniseed.

Rub together the butter and honey; add the eggs unbeaten and beat the mixture thoroughly. Sift together the flour, soda, and aniseed. Combine all the ingredients; drop from a teaspoon on to a buttered tin and bake in a moderate oven.

Honey Bran Cookies No. 2.

- 3 cups bran.
- ½ cup sugar.
- ¼ to ½ teaspoon soda.
- ¼ teaspoon cinnamon.
- ¼ teaspoon ginger.
- ½ cup honey.
- ½ cup milk.
- ½ cup melted butter.

Mix the sugar, cinnamon, ginger, and soda with the bran and add the other ingredients. Drop from a spoon upon a buttered pan and bake about 15 minutes.

Rolled Honey Wafers No. 1.

¼ cup butter.
¾ cup honey.
⅞ cup flour.
¼ teaspoon powdered cardamom or aniseed.

Mix together the butter and honey and add the flour, sifted with the spice. Spread out very thin with a broad long-bladed knife or spatula on a buttered, inverted dripping pan, or on flat tins made for the purpose. Mark off in 3-inch squares and bake in a slow oven until delicately browned. While warm, roll into tubular shape and hold until they cool and, if necessary, until they harden into shape. Honey wafers are not quite so tender as those made with sugar.

Rolled Honey Wafers No. 2.

¼ cup honey.
¼ cup sugar.
¼ cup butter.
⅞ cup flour.
¼ cup milk.
¼ teaspoon cardamom or aniseed.

Cream the butter; add the sugar, honey, and flour in the order named, and the milk very gradually. Cook as rolled honey wafers No. 1.

Nougat Wafers.

½ cup butter.
1 cup brown sugar.
½ cup milk.
⅞ cup bread flour.
4 teaspoons ginger, or
2 teaspoons powdered cardamom or aniseed.

Rub together the butter and the sugar and add alternately the milk and the flour sifted with the spices. Spread in a very thin layer on the bottom of an inverted dripping pan or on flat tins made for the purpose. Mark off into pieces about an inch wide and 4 inches long and put together in pairs with honey nougat filling made as follows:

Honey filling for nougat wafers.

1 cup sugar.
½ cup honey.
¼ cup water.
2 egg whites.

Boil the sugar, water, and honey together until the sirup makes a thread when dropped from a spoon, or until drops of it hold their shape when poured into cold water. Beat the eggs to a stiff froth, pour the sirup over them, put the dish holding the mixture in a place where it will keep warm but not cook rapidly, beat until it will hold its shape.

Honey Rissoles.

Pastry covering for rissoles.

½ cup lard.
2 egg yolks.
1 egg white.
⅔ cup water.
¼ cup brown sugar.
Flour.

Mix together all the ingredients but the flour and add enough of that to make a stiff dough. Roll out as thin as a knife blade, cut into round or square pieces, taking care to avoid the necessity of rolling out the second time, as this is likely to make the dough very tough. A honey filling is used with this dough and is made as follows:

HONEY FILLING FOR RISSOLES.

1 cup honey.
2 ounces candied orange peel.
Rye bread crumbs.
Aniseed.

Bring the honey to the boiling point, remove from the stove, and add as much bread crumb as it will moisten while it is hot. Add the orange peel and enough powdered aniseed to give a decided flavor. Roll this filling into small balls and lay one in the center of each piece of pastry; fold the pastry over and press the edges together. Bake in a hot oven.

DESSERTS.

The following recipes suggest ways in which honey can be substituted for sugar or molasses in many common desserts. The ingenious cook with honey to spare can easily work out others if she remembers what was said on pages 11 and 12 about the sweetening power and water and acid content of honey:

BAKED HONEY CUSTARD.

5 eggs.
½ cup honey.
4 cups scalded milk.
⅛ teaspoon powdered cinnamon.
¼ teaspoon salt.

Beat the eggs sufficiently to unite the yolks and whites, but not enough to make them foamy. Add the other ingredients and bake in cups or in a large pan in a moderate oven. The baking dishes should be set in water.

BOILED HONEY CUSTARD.

2 cups milk.
3 egg yolks.
½ cup honey.
⅛ teaspoon salt.

Mix the honey, eggs, and salt. Scald the milk and pour it over the eggs. Cook in a double boiler until the mixture thickens. This custard is suitable for use in place of cream on gelatin desserts, or to be poured over sliced oranges or stewed fruit.

HONEY PUDDING.

½ cup honey.
6 ounces bread crumbs.
½ cup milk.
Rind of half a lemon.
½ teaspoon ginger.
2 egg yolks.
2 tablespoons butter.
2 egg whites.

Mix the honey and the bread crumbs and add the milk, seasonings, and yolks of the eggs. Beat the mixture thoroughly and then add the butter and the whites of the eggs well beaten. Steam for about two hours in a pudding mold which is not more than three-quarters full.

HONEY CHARLOTTE RUSSE.

1 quart cream.
6 lady fingers.
½ cup delicately flavored honey.

Chill the honey by placing the dish containing it in a pan of ice water. Whip the cream and add it to the honey, mixing the two well. Line a dish with lady fingers and fill it with the honey and cream. Serve very cold.

HONEY MOUSSE.

4 eggs.
1 pint cream.
1 cup hot, delicately flavored honey.

Beat the eggs slightly and slowly pour over them the hot honey. Cook until the mixture thickens. When it is cool, add the cream whipped. Put the mixture into a mold, pack in salt and ice, and let it stand three or four hours.

HONEY ICE CREAM NO. 1.

1 quart thin cream. ¾ cup delicately flavored honey.

Mix ingredients and freeze.

HONEY ICE CREAM NO. 2.

1 pint milk. 1 cup honey.
Yolks 6 eggs. 1 pint cream.

Heat the milk in a double boiler. Beat together the honey and eggs, add the hot milk, return the mixture to the double boiler, and cook it until it thickens. Add the cream and when the mixture is cool, freeze it.

PRESERVED FRUITS.

CURRANTS.

Bar-le-Duc currants, an article of commerce often made with honey, sell for a relatively high price, in part no doubt because of the large amount of labor involved in preparing them. The seeds are removed from the currants by a method which mutilates the fruit very slightly; the fruit is then preserved in honey or sugar sirup. Those who wish to take the time to preserve currants in this way will find that a convenient way to remove the seeds is to cut a small slit in the side of each currant and remove the seeds by means of a needle. After this is done, weigh the currants and take an equal weight of honey. Bring the honey to the boiling point, add the currants, and allow them to cook at the boiling point for two or three minutes, or until the skins are tender, being careful not to let the mixture boil violently because this is likely to destroy the shape of the fruit. If the currants are so juicy as to liquefy the honey too much, they may be removed and the sirup reduced to the desired consistency, after which the currants may be replaced.

It is possible, of course, to preserve currants in honey according to the same recipe without the removal of the seeds, but the preserve thus obtained is not nearly so delicate as when the seeds are removed.

CRANBERRIES.

A very good preserve may be made from cranberries and honey which will remain in good condition for a long time. Take equal weights of cranberries, honey, and water. Cook the berries in the honey and water until the skins are soft. Remove the berries and boil down the sirup until just enough remains to cover the berries. Pour into glasses and cover as you would jelly. The appearance of the cranberries is improved if each one is pricked several times before cooking and if the cooking is slow at first. This gives the sirup an opportunity to penetrate the berries without destroying their form. A satisfactory method is to place all the ingredients in a double boiler and heat them very slowly. If this method is followed, the boiling down of the sirup is even more necessary than when the berries are cooked more rapidly.

STRAWBERRIES.

Take equal weights of strawberries and honey; mix the two and dry in the sun, or preferably in a warm oven; put into carefully sterilized glasses and cover with paraffin.

APPLES.

2 quarts apples cut into small pieces. 1 cup vinegar.
2 cups honey. 1 teaspoon cinnamon.

Heat the honey, vinegar, and cinnamon together and cook the apples, a few at a time, in the sirup until they become transparent. Pour the sirup which remains after all the fruit is cooked over the apples.

Fruit and Honey Jelly

A good jelly may be made from winter apples and honey, using a cupful of honey to each cupful of apple juice and proceeding as in ordinary jelly-making. Honey could probably be used with other fruits suitable for jelly, but no definite directions have been worked out in this laboratory. The more delicately flavored honeys are probably best for this purpose, alfalfa giving an especially spicy taste.

ICING, SAUCES, CANDIES, ETC.

Honey Icing.

1 cup granulated sugar.
½ cup water.
½ cup honey.
1 egg white.

Boil together the sugar and the water for a few moments and then add the honey, taking precautions to prevent the mixture from boiling over, as it is likely to do. Cook until drops of the sirup keep their form when poured into cold water, or to about 250° F. Beat the white of the egg until stiff, and when the sirup has cooled slightly pour over the egg, beating the mixture continuously until it will hold its shape. This frosting is suitable for use between layers of cake, but is rather too soft for the top. It remains in good condition and soft enough to be spread for many weeks and, therefore, can be made in large quantities for use as needed. After eight months, such icing made in this laboratory was found to be in good condition and soft enough to cut.

Sauce for Ice Cream.

2 tablespoons butter.
2 teaspoons cornstarch.
½ cup honey.

Cook together the cornstarch and butter thoroughly, being careful not to brown them. Add the honey and cook the mixture until it becomes hard when dropped into cold water and until all taste of raw cornstarch has been removed.

Pudding Sauce.

If a small quantity of water be added to the above sauce, its consistency is entirely changed; it becomes thinner and can not be made brittle even by dropping it into cold water. It is suitable for serving on various kinds of puddings.

Strawberry Sauce.

Strawberry sauce, for puddings or boiled rice, which is usually made by mixing butter, sugar, and mashed berries, is a good means of securing the strawberry flavor at times when berries are too high-priced to be used in large quantities. The substitution of honey for sugar has proved to be practicable. In fact, it obviates one of the chief difficulties in making this sauce—the tendency to curdle.

2 tablespoons butter.
⅔ cup mashed strawberries.
½ cup honey.

Beat together the honey and butter. Add the strawberries slowly, keeping the mixture cool by setting the dish in water. Serve on boiled rice or cottage pudding.

Salad Dressing.

4 egg yolks.
2 tablespoons vinegar or lemon juice.
2 tablespoons butter.
2 tablespoons honey.
1 teaspoon mustard.
1 teaspoon salt.
Paprika to taste.
1 cup cream.

Heat the cream in a double boiler. Beat the eggs, and add to them all the other ingredients but the cream. Pour the cream slowly over the mixture, beating constantly. Pour it into the double boiler and cook until it thickens, or mix all the ingredients but the cream and cook in a double boiler until the mixture thickens. As the dressing is needed combine this mixture with whipped cream. This dressing is particularly suitable for fruit salads.

Nougat.

⅔ cup honey.
½ cup brown sugar.
1 pound almonds.
2 egg whites.

Boil the honey and sugar together until drops of the mixture hold their shape when poured into cold water. Add the whites of the eggs, well beaten, and cook very slowly, stirring constantly, until the mixture becomes brittle when dropped into water. Add the almonds and cool under a weight. The candy can be broken into pieces, or may be cut and wrapped in waxed paper.

Honey Fudge.

2 cups sugar.
½ cup honey.
½ cup water.
2 egg whites.
1 teaspoon of vanilla extract.

Boil together the sugar, honey, and water until the sirup spins a thread when dropped from a spoon (about 250° F.). Pour the sirup over the well-beaten whites of the eggs, beating continuously and until the mixture crystallizes, adding the flavoring after the mixture has cooled a little. Drop in small pieces on buttered or paraffin paper. The vanilla may be omitted.

Honey Caramels.

2 cups granulated sugar.
½ cup cream or milk.
½ cup honey.
½ cup butter.

Mix the ingredients; heat and stir until the sugar is dissolved; then cook without stirring until a firm ball can be formed from a little of the mixture dropped into cold water. Beat the mixture until it crystallizes, pour into buttered pans, and cut into squares. The addition of pecan nuts improves these caramels.

Honey Popcorn Balls.

Honey can be heated up to about 245° F. without being greatly changed in color or flavor. If it is heated carefully most of the water is expelled. The honey then becomes hard on cooling and can be used for making popcorn balls. To make them, dip the popped corn into the hot honey, shape into balls and cool. Honey popcorn balls absorb moisture on standing in the air. They must therefore be either kept very closely covered or reheated and dried before being used.

○

BUREAU OF ENTOMOLOGY
DEC 6 - 1918
RECEIVED
Reserve

HONEY AND ITS USES IN THE HOME

CAROLINE L. HUNT
Expert in Nutrition
AND
HELEN W. ATWATER
Assistant in Nutrition

FARMERS' BULLETIN 653 [rev.] Feb. 1918

UNITED STATES DEPARTMENT OF AGRICULTURE

Contribution from the States Relations Service
A. C. TRUE, Director

Rev.ed. follows

Washington, D. C. Issued April 7, 1915; reprinted February, 1918

Show this bulletin to a neighbor. Additional copies may be obtained free from the Division of Publications, United States Department of Agriculture

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1918

KEEP A BEE and produce your own sweetening. Sugar is scarce, its price high, and you can not grow it in your garden. But honey contains several kinds of sugars, as well as some other substances, and a colony or two of bees in orchard, garden, or back yard will afford both pleasure and profit, as many thousands of people know, and at the same time will provide a wholesome food which will take the place of a large part of the sugar now consumed.

Not only is the bee valuable as a producer, but it offers a recreation which pays its own way, and is most beneficial in cross-pollinating the flowers of various economic plants.

Honey as it comes from the hive is in the form of comb honey, and as such appeals to most users. But enormous quantities of honey are now used for manufacturing purposes, and this demand is, of course, for the other form in which it is on the market—extracted honey.

This honey is usually pure and of good quality, and the advantage of comb honey, which retails at slightly higher price, is chiefly its attractiveness to the eye. The simplest way of using extracted honey is to serve it like a sirup, but there are many other methods explained in this bulletin.

HONEY AND ITS USES IN THE HOME.

CONTENTS.

	Page.		Page.
Ingredients of honey	3	Honey in cookery	11
Food value of honey	4	Bread and muffins	15
Flavor of honey	6	Cakes, cookies, etc	16
Wholesomeness	7	Desserts	23
Economy of honey as food	9	Preserved fruits	24
Uses of honey	10	Icing, sauces, candies, etc	25

INGREDIENTS OF HONEY.

IN THE DAYS before trade with the Tropics introduced cane sugar into temperate regions honey was by far the most common sweet substance available for human food. In very early times men discovered that the material deposited by honeybees in hollow trees and in the crevices of rocks was a valuable and agreeable food and learned to appropriate it to their own use. Such wild honey is still gathered in Palestine and in the less advanced parts of Africa, in Asia, and in South and Central America, that from Peru making an important article of export. Bee trees, which were considered a prize in pioneer times in this country, are still valued in some remote rural regions, and not infrequently people living in country or village take the comb from a colony of bees which has settled in a corner under the weatherboarding of a building or some similar place.

There are two kinds of natural honey, known as floral, or normal, and honeydew, or abnormal, the former being made from nectar, a sweet liquid secreted by flowers, and the latter from honeydew, a sweet substance deposited on the leaves of plants by plant lice and other insects. Unless otherwise stated, the term "honey" when used in this bulletin may be understood to refer to the kind made from nectar, or to that in which the quantity of honeydew is so small that it does not greatly affect the character of the product.

The chief materials that the worker bees bring to the hive are nectar, pollen, and propolis. They collect the pollen on the hairs on their bodies, place it in the so-called pollen baskets on their legs,

and thus carry it back to the hive to be deposited near the brood cells. This pollen is rich in nitrogenous material and is important as food for the young and developing bees (larvæ). A few grains usually find their way into the honey cells. Propolis or bee glue is obtained from the gums exuding from trees and shrubs. It is taken to the hive in the same way as pollen and is used to make the hive waterproof and sometimes to strengthen the edges of the comb. If any gets on the capping of the honey it tends to spoil the appearance of the combs; these traces of propolis are known as "travel stain."

Nectar is the material from which honey is made. The bees suck it out of the flower with their long tongues and swallow it into the honey sac where it undergoes some changes not yet well understood. It consists chiefly of sugar and water, the former constituting usually between one-fifth and two-fifths of the entire weight and the latter between three-fifths and four-fifths. With this substance are mixed small quantities of other materials, chiefly mineral matters, gums, and volatile bodies. To the latter the aroma and flavor of honey are chiefly due.

The changes by means of which nectar is transformed into the finished honey are technically known as "ripening." They take place partly in the honey sac of the bee, and partly in the cells of the comb, continuing even after the latter have been capped with wax. They consist mainly in removal of part of the water from the nectar, a task which the bees accomplish by warming the air of the hives and also by fanning the nectar in the cells, and in the change in the chemical nature of the sugars, which will be described later (see p. 5).

Wax is made in and secreted from special glands on the abdomen of the worker bee. Several pounds of honey are used in producing a pound of wax, and a high temperature must be kept up in the hive by the bees while it is being made. Because of the cost of wax secretion beekeepers usually try to arrange that the bees shall have little comb building to do except when comb honey is being produced.

FOOD VALUE OF HONEY.

Like most foods, honey, although preserving its general character, varies more or less from the average composition. The variations are of interest to the housekeeper in so far as they may affect the food value or the way in which the honey can be used to the best advantage in cookery. They may also be of decided interest to the food inspector, as departures from the usual composition may help him to detect the presence of adulterants.

So far as its food value is concerned honey may be roughly described as a sirup with a distinctive flavor and aroma made up of 4 parts sugar to 1 part water. There are several kinds of sugars present in honey, including cane sugar (sucrose), grape sugar

(dextrose), and fruit sugar (levulose); the last two together being called invert sugar. Some dextrin is also present as well as a variety of other substances in very small amounts. Included among them are nitrogenous substances (protein) which occur in quantities too minute to affect the food value of honey for man. Some of the other substances present in minute quantity, namely volatile oils, or other bodies of pronounced odor or flavor from the nectar, are valuable because they influence the flavor and aroma of the honey.

According to data gathered by the Bureau of Chemistry[1] honey, on an average, contains in round numbers per hundred parts 18 parts water, 78 parts carbohydrates (including 76 parts sugar and 2 parts dextrin), 0.2 part mineral substance, or ash, and nearly 4 parts of undetermined substances such as pollen grain, gum, bee glue, formic acid and volatile oils, and other flavor substances. These are average values and there is, of course, considerable variation in individual honeys. For instance, the proportion of water varies from about one-eighth to one-fourth of the total weight of the honey, being influenced by the moisture in the air at the time the honey is produced and the dryness of the atmosphere in which the honey is kept afterwards. Samples of honey from conspicuously dry localities (the southwestern part of the United States, for instance) and honeys made in other localities in very dry weather have a relatively low water content.

The most abundant of the mineral substances in honey are magnesia, lime, phosphoric acid, and iron. Since honey contains less than 1 part per hundred of mineral matter, it is obvious that even if eaten in large amounts it could not contribute greatly to the total mineral matter of the diet. However, it is claimed that unless care is taken in selecting foods there is a possibility that the diet may contain too little lime, and for this reason it is worth noting that honey contains this constituent. In respect to its ash content it is more comparable with maple sirup than with cane sugar from which the mineral substances originally present in the plant juices have been removed during the process of refining.

The percentage of the different sugars varies more or less, but under any circumstance the amount of cane sugar is small (some 2 parts per hundred) and less than in the nectar from which the honey is made. The proportion of dextrose (grape sugar) and levulose (fruit sugar) making up the total invert sugar varies in honey as it does in the nectar from which it is made, but this is of no importance in planning meals. However, it is of practical importance for the reason that it determines the character and appearance of the honey. Honey will granulate easily if the proportion of dextrose is large, but this is

[1] U. S. Dept. Agr., Bur. Chem. Bul. 110.

not the case if levulose predominates. For example, alfalfa honey which contains a high percentage of dextrose often forms such a solid mass of crystals that it is sold in cakes. This may be an advantage sometimes. Thus, the solid alfalfa honey can be used for such purposes as filling for layer cakes, for which liquid honey would not be so suitable because it would run out. The proportion of dextrin present in normal or nectar honey is so small that it affects neither food nor cooking values. Abnormal or honeydew honey, however, contains so much dextrin that it requires special handling in cooking. This is a matter of interest to professional bakers rather than to housekeepers, as such honey is not commonly used in the home.

Since the principal ingredient of honey is sugar, it is obvious that it should be classed with the fuel foods which supply the body with the energy it needs for the various tasks it performs rather than those whose function is to build and repair the body—that is, the "tissue formers," as they are sometimes called. If honey contained no water its energy value would be practically the same, pound for pound, as that of cane sugar. However, since about one-fifth of its total weight is water, it follows naturally that its energy value is one-fifth less than that of cane sugar, being 1,485 calories per pound.

In planning meals, particularly in hospitals, children's homes and other institutions where large quantities are required, it is often convenient to have some quick and fairly accurate method of estimating the relative value of different articles of diet which are used in similar ways. For this reason it is worth remembering that an ordinary tablespoonful of honey which weighs a trifle over an ounce will furnish the body 100 calories. The same amount of energy would be supplied by five-sixths of an ounce of sugar, by 1¼ ounces of molasses, or by a little less than an ounce of preserves (such as orange marmalade).

FLAVOR OF HONEY.

The flavor and aroma of honey depend largely upon the blossoms from which the nectar is obtained. The nectar of each kind of flower contains a distinctive combination of oils and other substances which gives the blossoms their special fragrance, and these substances are retained in the honey made from the nectar. It is practically impossible to prevent bees from visiting more than one kind of flower during a given period, and, strictly speaking, almost every kind of honey is made from a mixture of different nectars. Nevertheless, when the hives are situated near a large supply of one sort of blossom, its nectar usually predominates and its flavor and aroma can be easily recognized in the honey. It is perfectly correct, therefore, to speak of basswood honey, fruit-blossom honey, buckwheat honey, etc.

Different localities naturally produce different kinds of honey, and different kinds may be produced in the same locality at different seasons, according to the kinds of flowers which abound. Several famous European honeys, among them the choice French variety from Narbonne, owe their characteristic aromatic flavor to wild thyme and other flowers of the mint family. In orange honey from districts where orange blossoms abound the peculiar aroma and flavor of the flowers are very clearly marked. Sage and clover honeys are well-known American varieties in which the characteristics of the nectar are easily and pleasantly recognized.

Choosing between honey from different flowers is mainly a matter of taste; and taste in honey, as in many other things, seems to depend more on what one has been accustomed to than on any real superiority. For example, it sometimes happens that a person who has always used buckwheat honey with its full-bodied, rather acid flavor, imagines that a mild, light honey with less of the characteristic "comby" taste must be adulterated, whereas a person who is familiar only with some such delicate honey as white clover or alfalfa may consider buckwheat very inferior, or even fancy that it is not genuine floral honey.

The relative abundance of different flowers and consequently the flavor of the honey vary so greatly in different seasons that beekeepers can not count on a regular yield of uniform honey, and their patrons may be disappointed to find that the honey of one year is different from that of the year before. To overcome this difficulty many of the best wholesale dealers have recently adopted the practice of mixing several honeys to produce a blend. This process is like that adopted long ago in the case of teas. To blend honeys so that the mixture will be generally acceptable requires a great deal of skill, but when the consumer has found a blend which pleases him, he is more likely to be able to get honey of that flavor season after season than if he depends on unmixed honeys.

WHOLESOMENESS.

Because the chemical change effected by the bee in the sugars of the nectar is the same as that effected by digestive ferments, and the principal sugars may therefore be considered to have undergone the first step of digestion, honey is often said to contain predigested sugar, and to be more wholesome than cane sugar. There is no reason, however, to believe that the healthy human body is not equal to the task of digesting any sugar, so a special claim made for the wholesomeness of honey on this ground seems unimportant. It is generally believed that the energy from sugar is liberated for the use of the body more quickly than that from such other fuel foods as

starch and fat. Hence it is said to delay the oncoming of fatigue during great muscular exertion. For this reason some form of sweet is included in almost all army rations and is often used by persons undergoing severe physical exertion, such as mountaineers and athletes. Although no experiments have been made to test the value of honey in this respect, it seems safe to suppose that it would have the same good effect as other sweets.

Everyone knows that eating too much ordinary sugar upsets digestion. The differences in the effects of too much honey and too much cane sugar are rather complicated, but it is safe to say that eating too much of either should be avoided, even by healthy people.

For some persons suffering from serious digestive disturbance honey may be a safer form of sugar than cane sugar, but with other forms of indigestion the opposite is true; it depends upon the particular form of disturbance, and such matters should be decided by a skillful physician for each individual case. For persons of very delicate digestion the particles of wax in comb honey may cause trouble, as it is believed that the digestive processes do not have any effect on them. For normal persons, however, the wax should be as harmless as are the particles of indigestible material contained in many other wholesome foods.

Honey is sometimes said to have a mildly laxative effect, and the statement is doubtless true, as it is of many other food materials, especially those of vegetable origin. If a person had to live on a very limited number of foods, especially if he had a tendency to constipation, it might be wise to use honey rather generally in preference to other forms of sweet; but the effect of such small amounts of honey as would be used in an ordinary diet would hardly be worth taking into consideration. Bran biscuits made with honey instead of sugar (see p. 16) would owe any advantage they might have over the ordinary bran biscuit to the laxative effect of the honey.

Other medicinal qualities have been claimed for honey, particularly in older writings, and it still finds use in medicinal preparations, but no doubt more because of tradition and of the flavor and texture it imparts than for actual medicinal properties. From the standpoint of the honey industry this is a matter of little importance, for honey is regarded by the vast majority of its users as a food and not as a drug product.

Even if honey has no such specific medicinal advantages, this does not in the least lessen its general value as a wholesome, useful foodstuff, well worthy of even more extended use than it already has, not only because it is agreeable and economical in itself, but also because it introduces a pleasing variety and thus makes the diet more appetizing, and consequently more wholesome.

ECONOMY OF HONEY AS FOOD.

Whether or not honey can be economically used in the diet as a source of nourishment depends of course upon its food value and its price as compared with other food for which it may be substituted. To compare food materials in these two respects is no easy task because, besides varying in price with time and place, they may differ widely in the kind and the quantity of the nutrients which they supply. If honey is compared with cane sugar at 7 cents a pound on the basis of the energy which it provides for the body, it should sell for not more than 6 cents a pound in order to be as economical. Comparing it on the same basis with butter at 40 cents a pound, it is evident that it might sell for 17 cents a pound and be equally economical as a source of energy.

The differences between the wholesale prices of comb honey and of extracted honey are much greater than those between the retail prices. A pound of extracted honey in a jar usually sells at retail for about the same as the average section of comb honey, which has a net weight of 14 ounces. On the other hand, the wholesale price of comb honey is usually about 50 per cent higher than that of extracted honey. The reason for this is that the producer of comb honey does far more of the work of getting his product ready for the final market than does the producer of extracted honey. As the sections leave his hands so they are passed over the counter to the housewife or other retail purchaser. Extracted honey, on the contrary, is sold by the producer to the bottler, not in pound lots but in 5-gallon cans or barrels. The bottler does the work of blending, liquefying, bottling, labeling, and packing. It is possible, therefore, for the consumer to save money by buying extracted honey at wholesale and avoiding the cost of the various kinds of work which prepare it for the retail market.

Where only small quantities of honey are used, the effort to buy in the cheapest market may cost more in energy than it saves in money. Where, however, large supplies are bought, the purchaser should try to get into direct communication with the producer and take advantage of the parcels post as a means of transportation. The names of dealers in his vicinity can often be obtained from the bee-keepers' magazines, or by writing to the State inspector of apiaries. The names of State inspectors and often those of local dealers can be obtained by addressing the Bureau of Entomology of the United States Department of Agriculture.

Now that extracted honey is usually pure and of good quality, the advantage of comb honey lies chiefly in its attractiveness to the eye. Unless very great care is taken in extracting honey, some of the

volatile bodies on which its flavor depends will probably be lost. Hence it often happens that the flavor of comb honey is really slightly superior to the same kind extracted. Many persons think that the presence of the wax gives the honey a more pleasant consistency for table use. Whether these advantages are worth the extra cost each consumer must decide for himself.

Comb honey is commonly graded according to finish and color. It is described as Extra Fancy, Fancy, No. 1, or No. 2, according to the evenness with which the sections are filled, the freedom of the product from propolis or other stains, and the number of unsealed cells. It is graded according to color as white, light amber, amber, and dark. From the point of view of food value alone, finish and color are not of importance, though dark honeys are usually of stronger flavor.

In order to comply with the Federal Food and Drugs Act which applies to all goods shipped from one State to another, every section of honey and every package containing extracted honey must be marked with the net weight. In comb honey this is understood to be the weight of the comb and the honey and to exclude the weight of the wooden frame.

In choosing honey too much importance should not be attached to lightness of color, for some of the best varieties are dark; nor should granulation be thought to imply adulteration. The truth is that crystallization is more likely to occur in pure than in impure honeys, and some pure varieties, especially alfalfa honeys, granulate so easily that they are often sold to the consumer in solid form. The crystals can easily be dissolved by heating the honey, which should be done in a double boiler or other kind of water bath. If the temperature does not go beyond 160° Fahrenheit, there is little danger that either color or flavor will be affected.

Unless in a sealed package, honey should be kept in a dry place; otherwise it is likely to absorb moisture and spoil, for when dilute it will ferment or sour readily, as will any other similar sugar sirup. Heat and dryness are usually found together in the household, and ordinarily the safest places for honey are the warmest places; the least desirable is the refrigerator.

USES OF HONEY.

Honey is used both in its natural state and as an ingredient of cooked food. In this country it is more commonly used uncooked than cooked, and practically all comb honey is consumed in this way. Honey is much more commonly used in cookery in Europe than in America, though commercial bakers and confectioners in the United States use much larger quantities than many persons realize.

The simplest way of using honey is to serve it like jam or sirup with bread, breakfast cereals, boiled rice, pancakes, and other mild-

flavored foods. As ordinarily used on bread, an ounce of honey "spreads" as many slices as an ounce of jam. When it is to be used in the place of sirup some people dilute it by mixing it with hot water, which has the effect of making it not only less sweet but also easier to pour.

Honey or a mixture of honey and sugar sirup can be satisfactorily used for sweetening lemonade and other fruit drinks. Sirup of any kind is more convenient for this purpose than undissolved sugar, and when charged water is to be added it has a further advantage since it has less tendency to expel the gas. It is the custom of many housewives to keep a sirup for this purpose, particularly in hot weather, and variety can be secured by occasionally using honey.

Honey can be used in place of sugar for some kinds of preserving, and there is reason to believe that fruits cooked in it keep very well indeed. Bar-le-Duc currants, which form a very delicate and expensive article of commerce, are often made by cooking currants in honey. They are frequently served with cream cheese and crackers or other form of bread. A satisfactory substitute may be secured by serving honey and tart fruit, either cooked or uncooked, with cottage cheese and bread and butter. Three ounces of cottage cheese curd, two ounces of bread, two-thirds ounce of butter (either added to the curd or spread on the bread), two ounces of honey, and six ounces of strawberries or other watery fruit would make a reasonably well-balanced meal. Sometimes honey alone is served with cream cheese. Crisp crackers, spread with cream cheese and honey, form a good combination from the point of view of nutritive value and taste. Honey may be substituted for sugar in baking apples.

HONEY IN COOKERY.

When used in cookery honey does not always produce the same effect as corresponding quantities of sugar or molasses, and the reasons for some of the differences between them are not well understood. Careful experiments with various types of honeys and honey recipes were therefore made in the nutrition laboratory of the United States Department of Agriculture, in the hope of explaining such points. Most of the facts stated in the following paragraphs were obtained in this way, and all the recipes (pp. 15–26) were tested there.

The fact that honey consists principally of sugar and water and is slightly acid suggests that it is a suitable substitute for molasses in cookery. As a matter of fact, it can be used in the place of molasses in all forms of breads, muffins, and cakes, and makes a more delicately flavored product. It contains less acid than molasses, however, and so requires less soda when it is substituted for molasses in recipes which do not include sour milk or other acid, and the cook

must be careful about the amount of soda used. Many trials were made with different kinds of honey in this laboratory which showed that the allowance of soda to a cupful of honey very generally ranges between one-fourth and one-half of a level teaspoonful. Unless the cook is thoroughly familiar with her honey, she would do well to mix and bake a small sample of dough before she decides on the amount of soda to be put into the main portion.

When honey is to be substituted for common sugar it is desirable to know not only how it compares in sweetness, but also how much allowance must be made for the water which it contains. Assuming a cupful of good honey to measure one-half pint, it should weigh about 12 ounces. Of this, 9 to 10 ounces, roughly speaking, is sugar. A cupful of honey, therefore, corresponds to a little more than a cupful of cane sugar. Hence it is safe to estimate that a cupful of honey will sweeten a dish just about as much as a cupful of sugar. Besides the sugars, there is about one-fifth of a cupful of water in a cupful of honey. Theoretically, therefore, in making cake one should substitute honey for sugar cupful for cupful, and for each cupful of honey use one-fifth cupful less of the milk or other liquid which the recipe calls for. For practical purposes, however, it is accurate enough to consider that the water in a cupful of honey is one-fourth of a cupful. This rule was found to hold good with a large number of ordinary cake recipes which were tested in this laboratory. These facts, if kept in mind, make special honey recipes unnecessary and enable the cook with very slight calculation to modify ordinary ones so that honey can be used in place of sugar. Besides slightly changing the flavor of the cake, honey used in the place of sugar makes it keep moist longer. A honey cake made with butter will keep its quality until the butter grows rancid, and one made without butter will keep fresh for months and even improve in flavor. What is true of the cakes is also true of the dough; it can be kept almost indefinitely. Evidently, then, honey is especially useful in recipes without butter. For this reason, most of the honey cakes experimentally studied in this laboratory were made according to the following formula which is typical of Honig Kuchen, or German Christmas cake: Three-fourths cup honey, one-half cup sugar, two cups or more flour, one-fourth teaspoon powdered ginger, one-half teaspoon powdered cardamom seed, one teaspoon cinnamon, one-eighth teaspoon cloves, a speck white pepper, a pinch salt, one-fourth to one-half teaspoon soda, one tablespoon water, and two ounces blanched almonds cut in small pieces or chopped.

The directions for making the honey cakes, not only in the older cookbooks, but also in many modern bakers' manuals, are extremely elaborate; one of the purposes of the experiments made in this

laboratory was to determine how many of the suggested precautions are necessary.

Recipes usually direct that the honey be brought to the boiling point and then skimmed and cooled. This must be done with great care, for the honey is very likely to boil over. Experiments with a large variety of honeys such as are ordinarily purchased in the United States for household use, showed that nothing rises to the top during the boiling which can not be easily stirred back into the liquid. It seems likely therefore that the custom of boiling had its origin at the time when honey, or at least the grades bakers use, was much less carefully prepared than at present and contained impurities of many kinds. A cake made by stirring flour directly into cold honey was found to be in no way inferior to those made with honey which had been heated.

Some recipes found in the older cook books, particularly those of foreign origin, direct that the spices be boiled with the honey and give as a reason for this that the heating brings out their flavor and makes them "go further." The weight of this argument is obviously difficult to determine, but the work carried out in the Nutrition Laboratory gave no evidence that the short heating at the beginning is of special importance in comparison with the long heating which the materials must receive while the cake is being baked.

The older recipes almost invariably direct that the dough be kept for a certain length of time, sometimes one day, sometimes more, before the soda is added. So reliable an authority as König says that this is because, owing to the presence of bacteria, the acidity of the mixture increases with time, and that therefore more soda can be used after the dough has stood. To test this point, dough was mixed in this laboratory and analyzed by the Bureau of Chemistry; it was found to have 0.0775 per cent of acidity immediately after being mixed, and 0.1 per cent after four days' time. Another sample increased in six days from 0.108 per cent to 0.117 per cent, and during the following six days to 0.125 per cent. It seems probable, therefore, that the acid does usually increase; but even so, the question arises whether there is not in the beginning enough acid to act on soda sufficient to raise the cake. In order to determine this, two samples of dough were mixed. To No. 1 the soda was added at once and baking followed immediately. No. 2 was kept for a week, when the soda was added and the cake was baked. The second was neither lighter nor in any way superior to the first.

It is frequently stated that the dough can be more easily kneaded if it is allowed to stand several days. In order to test this point, a dough was mixed which was stiff enough to hold its shape, but which stuck to the hands and the molding board. After a week's time it

could be molded freely on an unfloured board without sticking to it. This argument for keeping the dough seems therefore to be sound.

It is sometimes said that the reason why cakes made with honey keep soft for a long time is that they absorb moisture from the air. To test this point a cake made according to the recipe already given was weighed at different intervals during 7½ months. The weight of the dough was 526 grams, the weight of the cake on the day of baking, April 17, 1913, was 499 grams after it had been removed from the pan, and at the final weighing on December 2 of the same year, it weighed 469.7 grams. The loss of weight was continuous during all this time, with the exception that in the late summer there was a slight increase in the weight, probably due to unusual dampness of the air; this was followed by a relatively great loss. On December 2, when the cake was cut, it was in good condition, and had a fine flavor and the consistency of a soft cooky. The experiment was repeated with small honey cakes, and these also showed no increase in weight before softening. While these experiments are not sufficient for definite conclusions, they indicate that the increased softness of the honey cake is not due to the absorption of water.

Icing made with honey or with part honey and part sugar according to the recipe on page 25 has the same advantage that honey cakes have. Such icing made in this laboratory was found at the end of 10 months to be soft and in as good condition as when originally made. It would, therefore, seem to be suitable for cakes that are to be kept for a long time.

In most of the recipes in foreign cookbooks "potash" (potassium bicarbonate) is recommended for use with honey to raise the dough. This is very similar in its properties to ordinary baking soda (sodium bicarbonate) and seems to have no advantage over it for this purpose. Whatever may have been the conditions in earlier times in Europe, baking soda is a common kitchen commodity in most American homes, and the potassium bicarbonate is almost unknown for household purposes. Both the potassium bicarbonate and baking soda gave much better results in the honey recipes tested than did the baking powder, and naturally, since the acid honey calls for an alkali like soda rather than a mixture of acid and alkali such as baking powder. If baking powder were used it should be in addition to soda enough to neutralize the acid of the honey, not merely as a substitute for soda, just as housekeepers sometimes neutralize sour milk or molasses with soda and then add baking powder to raise the dough.

In the countries where honey cakes have come to perfection spices are used which are somewhat uncommon in this country, and it is reasonable to suppose that long experience has taught a good com-

bination of flavors. Cardamom seed, a rather old-fashioned flavor which is still sometimes found in candies, seems to combine more satisfactorily with the flavor of honey than some of the spices which are better known in our kitchens. It is best, however, to use it in combination with other flavoring materials. The following has been found to be a good combination:

Salt, 1 part by measure.
White pepper, 1 part.
Nutmeg, 2 parts.
Cloves, 2 parts.
Ginger, 4 parts.
Cardamom, 8 parts.
Cinnamon, 16 parts.

These should be thoroughly mixed and can be made up in quantity and kept ready for use.

Aniseed and coriander seed are also often used in honey cakes in combination with other spices. The following mixture is recommended in a baker's handbook,[1] the amounts given being suitable for 10 pounds of dough:

2 ounces ground cinnamon.
½ ounce ground cloves.
2 ounces aniseed.
1 ounce finely ground coriander seed.

In considering the uses of honey in cookery, it is well to remember that it owes its flavor to bodies which are very volatile and that for this reason it should not be heated unnecessarily hot or unnecessarily long.

In order to learn how honey is used in cookery, standard cookbooks from many countries were examined and many persons familiar with honey cookery were consulted. Innumerable as the recipes were, it was soon found that they belonged mainly to only a few different types, such as breads made with honey, honey cakes made with or without butter, fruits preserved in honey, and sauces and candies made with honey. Many recipes were tested in this laboratory, and some of the more desirable ones were adapted for use in the United States and are published here.

BREAD AND MUFFINS.

Honey is not often used in bread making but there is no reason why it may not be used in yeast bread as food for the yeast plant or be substituted for molasses or sugar in varieties of bread which call for such sweetening. A few recipes are here given.

BRAN BROWN BREAD.

1 cup white or whole wheat flour.
1 teaspoon soda.
½ teaspoon salt.
1 cup bran.
½ cup honey.
1 cup sour milk.
½ cup raisins floured.

[1] The Twentieth Century Book for the Progressive Baker. By F. L. Gienandt. Boston, 1913, p. 129.

Sift together the flour, soda, and salt, and add the other ingredients. Steam three hours or bake 40 minutes in a slow oven. If the amount of milk is increased by half, the bread is more delicate and has a somewhat higher food value.

Steamed Brown Bread.

1 cup yellow corn meal.
2 cups graham flour.
⅔ cup honey.
2 cups sour milk.
1 teaspoon salt.
1½ teaspoons soda.
1 tablespoon boiling water.
1 cup seeded raisins.

Mix together the meal, flour, and salt; add the sour milk and the honey and then the soda dissolved in the boiling water; and the raisins. Steam three hours in covered receptacles, which should be not more than two-thirds full at the beginning of the cooking.

Honey Bread.

2 cups honey.
4 cups rye flour.
1 teaspoon soda.
4 teaspoons aniseed.
2 teaspoons ginger.
4 teaspoons powered cardamom seed.
2 egg yolks.
½ cup brown sugar.

Sift the flour with the spices and soda and add the other ingredients. Put the dough into shallow buttered pans to the depth of about an inch and bake in a hot oven.

Honey and Nut Bran Muffins.

½ cup honey.
1 cup flour.
½ to ½ teaspoon soda.
½ teaspoon salt.
2 cups bran.
1 tablespoon melted butter.
1½ cups milk.
⅔ cup finely chopped English walnuts.

Sift together the flour, soda, and salt, and mix them with the bran. Add the other ingredients and bake for 25 or 30 minutes in a hot oven in gem tins. This will make about 16 large muffins, each of which may be considered roughly to be a 100-calorie portion and to contain 2 grams of protein.

Honey and Nut Sandwiches.

Mix the honey with pecan meats or almonds minced, and make into sandwiches with small baking-powder biscuits.

Honey and Cream Cheese Sandwiches.

Mix honey with cream cheese and use as filling for bread or baking-powder biscuit sandwiches. Chopped nut may be added to the honey and cheese if desired.

CAKES, COOKIES, ETC.

By far the most general use of honey in cookery is for cakes. Of these there is an almost endless variety, from rich fruit cake in loaves or elaborate pastries with honey filling to simple cookies. As has been pointed out, the honey flavor combines especially well with spices. The presence of honey also makes the cakes keep fresh longer. These two facts probably explain why the honey cakes, which belong mainly to the general order of gingerbreads or spice

cakes, are so largely produced by commercial bakers. Many of these are rather elaborate to make, and for that reason some of the simpler kinds of honey cakes may be preferred by the busy housekeeper.

Hard Honey Cake.

¾ cup honey.
½ cup sugar.
2½ cups flour.
1 egg.
½ teaspoon ginger.
1 teaspoon cinnamon.
½ teaspoon ground cardamom seed.
½ teaspoon cloves.
Speck white pepper.
Speck salt.
½ teaspoon soda.
1 tablespoon water.
2 ounces blanched almonds cut into small pieces or chopped.

Sift together the flour and spices, dissolve the soda in the water, beat the egg and combine all the ingredients. Beat or knead the mixture thoroughly. Cook a small sample. If it does not rise sufficiently, add a little more soda and honey; if it falls, add a little more flour. Roll out the dough to the thickness of about three-fourths of an inch and bake in a hot oven. When the cake is done glaze it with a thick sirup of sugar and water and allow it to dry in a slow oven or in some other warm place. While it is still warm, cut it into long strips. Or it may be left in one large cake, to be cut into very thin slices when served. This cake will become very hard on cooling and will not be soft enough to eat for several weeks, but will keep in good condition for an indefinite length of time.

Butter Honey Cake.

1½ cups honey.
½ cup butter.
3 egg yolks.
5 cups flour.
2 teaspoons ground cinnamon.
½ teaspoon salt.
1½ teaspoons soda.
2 tablespoons orange-flower water (water may be substituted).
Whites 3 eggs.

Rub together the honey and butter; add the unbeaten yolks and beat thoroughly. Add the flour sifted with the cinnamon and the salt; and the soda dissolved in the orange-flower water. Beat the mixture thoroughly and add the well-beaten whites of the eggs. Bake in shallow tins and cover with frosting made as follows:

Orange frosting for butter honey cake.

Grated rind 1 orange.
1 teaspoon lemon juice.
1 tablespoon orange juice.
1 egg yolk.
Confectioners' sugar.

Mix all ingredients but the sugar and allow the mixture to stand for an hour. Strain and add confectioners' sugar until the frosting is sufficiently thick to be spread on the cake.

For the cinnamon in the Butter Honey Cake the following mixture of spices may be substituted:

½ teaspoon ginger.
2 teaspoons cinnamon.
1 teaspoon ground cardamom seed.
1 teaspoon cloves.
¼ teaspoon nutmeg.
¼ teaspoon white pepper.
Chopped citron or nuts may also be added.

This mixture may also be flavored with ginger, aniseed, or cardamom seed.

Butter Honey Cake No. 2.

1 cup honey.
½ cup butter.
½ teaspoon ginger.
½ teaspoon cinnamon.
1 teaspoon ground cardamom seed.
3 eggs.
3 cups flour.
½ to 1 teaspoon soda.
1 ounce candied orange peel.
1 ounce candied lemon peel, or
1 cup seeded raisins.

Mix the honey and butter by warming slightly and stirring; add the spices and the yolks of the eggs unbeaten and beat the mixture thoroughly. Add the flour and the soda dissolved in a little water, then the whites of the eggs beaten stiff, and finally the fruit. Bake in a moderate oven.

Nut Honey Cake.

2 cups brown sugar.
2 cups honey.
6 egg yolks.
3 cups flour.
Speck of salt.
1½ teaspoons soda.
3 teaspoons ground cinnamon.
½ teaspoon ground cloves.
½ teaspoon ground nutmeg.
½ teaspoon allspice.
1 cup chopped raisins.
½ ounce citron cut in small pieces.
½ ounce candied orange peel cut in small pieces.
½ pound almonds coarsely chopped.
Whites of 3 eggs.

Mix the sugar, honey, and the yolks of the eggs, and beat thoroughly. Sift together the flour, salt, spices, and soda. Combine all ingredients but the whites of the eggs. Beat the whites of the eggs till they are stiff and add them last. Pour the dough to the depth of about half an inch into well-buttered tins, and bake in a slow oven for one-half hour.

Frosting for Nut Honey Cake.

1½ cups sugar.
3 egg whites.
½ cup water.

Boil the sugar and water until the sirup forms a thread when dropped from the spoon. While still hot, pour the sirup over the well-beaten whites of the eggs, beating the mixture until it is of the right consistency to spread.

Chocolate Nut Honey Cake.

To the above cake add 3 ounces of chocolate grated.

Soft Honey Cake.

½ cup butter.
1 cup honey.
1 egg.
½ cup sour milk.
1 teaspoon soda.
½ teaspoon cinnamon.
½ teaspoon ginger.
4 cups flour.

Rub the butter and honey together; add the egg well beaten, then the sour milk and the flour sifted with the soda and spices. Bake in a shallow pan.

Honey Sponge Cake.

½ cup sugar.
½ cup honey.
4 eggs.
1 cup sifted flour.

Mix the sugar and honey and boil until the sirup will spin a thread when dropped from the spoon. Pour the sirup over the yokes of the eggs which have been beaten

until light. Beat this mixture until cold; then add the flour, and cut and fold the beaten whites of the eggs into the mixture. Bake for 40 or 50 minutes in a pan lined with buttered paper, in a slow oven.

This cake can be made with a cupful of unheated honey in place of the honey and sugar sirup, but the quality is not quite so good.

Honey Pound Cake.

A good pound cake can be made by using equal weights of honey, sugar, eggs, flour, and butter. A little soda should be added because of the acidity of the honey, and a good flavoring is cardamom seed and orange-flower water. Or a cake similar to pound cake may be made as follows:

1 cup sugar.
½ cup honey.
1 cup butter.
4 eggs.
2 cups pastry flour.
½ teaspoon powdered cardamom seed.
½ teaspoon soda.
½ teaspoon orange-flower water.

Rub together the butter and sugar, and add the honey. Add the yolks of the eggs well beaten. Finally, add the whites of the eggs, beaten to a stiff froth, and the orange-flower water. Add gradually the flour sifted with the soda and cardamom seed. Beat the mixture for 10 minutes. Put the dough into a warm tin with high sides, and bake in a slow oven one hour.

Ribbon Cake.

UTILIZING CANDIED HONEY AS FILLING.

½ cup butter.
2 cups sugar.
4 eggs.
1 cup milk.
3½ cups flour.
5 teaspoons baking powder.
1½ teaspoons ground cardamom seed.
1½ teaspoons ginger.
¾ teaspoon cinnamon.
¾ teaspoon cloves.
½ cup raisins, seeded and cut in pieces.
½ cup figs, finely chopped.
1 tablespoon honey.

Rub the butter and sugar together and add the yolks of the eggs. Sift together the flour and baking powder and add them to the mixture, alternating them with the milk. Finally, add the whites of the eggs well beaten. Bake two-thirds of the mixture in two layer-cake pans. To the remainder add spices, fruit, and honey, and bake in a layer-cake pan. Put layers together with crystallized honey.

Honey Fruit Cake.

3 cups flour.
2 teaspoons soda.
3½ cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed.
½ teaspoon cloves.
3 pounds raisins (seeded).
1½ pounds currants.
1 pound citron.
1 pound candied cherries.
1 pound candied apricots.
1 pound candied pineapple.
½ cup sour jelly, or
½ cup white grape juice.
2 teaspoons vanilla.
2 ounces candied orange peel.
2 ounces candied lemon peel.

Cut the candied fruit into small pieces, with the exception of the cherries, which should be left whole. Place the fruit in a large dish and sift over it one-half of the flour, mixing thoroughly. Sift the soda with the remainder of the flour. Bring the honey and the butter to boiling point and while still hot add the spices. When the mixture is cool, add the well-beaten yolks of the eggs, then the flour and grape juice or jelly and the well-beaten whites. Finally, add the fruit. The cake should be divided into three or four parts and put into buttered dishes covered with buttered paper tied closely over the tops. Steam for five hours, remove the paper, and bake in a very slow oven for an hour. This makes a very rich cake consisting chiefly of fruit. For the sake of economy, the flour can be increased to even twice the quantity without affecting the quality very much.

Honey Fruit Cake No. 2.

4 cups flour.
3 teaspoons soda.
2 cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed.
½ teaspoon cloves.
3 pound raisins (seeded).
4 ounces citron.
1 pound cranberries.
1 pound canned pineapple.
1 pound dried apricots.
1 pound dried apples.

To prepare the cranberries, pineapples, apricots, and apples, cook each in honey till it is soft; remove from the honey and dry in a very slow oven. A little water should be added to the honey in which the cranberries are cooked, a good proportion of ingredients being equal weights of cranberries, water, and honey. To any honey left over from cooking the fruits add enough honey to make up the total amount called for by the recipe. Mix and cook the cake in the same manner as honey fruit cake No. 1.

Honey Drop Cakes.

½ cup honey.
½ cup butter.
½ teaspoon cinnamon.
⅛ teaspoon cloves.
1 egg.
1½ to 2 cups flour.
½ teaspoon soda.
2 tablespoons water.
1 cup raisins, cut into small pieces.

Heat the honey and butter until the butter melts. While the mixture is warm add the spices. When it is cold add part of the flour, the egg well beaten, the soda dissolved in the water, and the raisins. Add enough more flour to make a dough that will hold its shape. Drop by spoonfuls on a buttered tin and bake in a moderate oven.

Yellow Honey Cake.

½ cup sugar.
2 egg yolks.
⅔ cup honey.
½ teaspoon cinnamon.
⅛ teaspoon cloves.
1½ cups flour.

Sift together the flour and the spices. Mix the sugar and egg yolks, add the honey, and then the flour gradually. Roll out thin, moisten the surface with egg white, and mark into small squares. Bake in a moderate oven.

Honey Cookies No. 1.

½ cup honey.
½ cup sugar.
2½ cups flour.
½ teaspoon soda.
1½ teaspoons cinnamon.
1 teaspoon cloves.
1 teaspoon allspice.
2 ounces finely chopped candied orange peel.
¼ pound walnut meats finely chopped.

Sift together the flour, spices, and soda, and add the other ingredients. Knead thoroughly, roll out thin, and cut with a biscuit cutter. These cookies are very hard.

Honey Cookies No. 2.

½ cup honey.
½ cup sugar.
½ cup milk.
3 tablespoons lard.
2 egg yolks.
4 cups flour.
½ teaspoon salt.
1 teaspoon ground cinnamon.
½ cup finely chopped almonds.
½ teaspoon soda or 2 teaspoons baking powder.

Bring the first four ingredients to the boiling point and allow the mixture to cool. Sift together the flour, cinnamon, and soda or baking powder. Combine all the ingredients. Roll the mixture out thin on a floured board. Cut out and bake in a moderate oven on tins which have been greased and floured. To prepare the tins properly, brush them over with melted butter and sifted flour, turn them over, and shake off as much as possible of the flour.

Honey Cookies No. 3.

½ cup water.
1 pound brown sugar or 2 cups packed solidly.
½ cup lard.
1 cup honey.
½ cup egg yolks.
1 teaspoon soda.
6 cups flour.
1 teaspoon powdered cardamom seed.
1 teaspoon cinnamon.

Heat the water, sugar, lard, and honey until the lard is melted. When cool, add the yolks of the eggs and the flour, sifted with the soda, and spices. Roll out on a floured board and cut into any desired shape. Place a small piece of citron in the middle of each cooky.

Honey Bran Cookies No. 1.

2 tablespoons butter.
½ cup honey.
2 eggs.
¼ to ½ teaspoon soda.
½ cup flour.
1 cup bran.
½ teaspoon powdered aniseed.

Rub together the butter and honey; add the eggs unbeaten and beat the mixture thoroughly. Sift together the flour, soda, and aniseed. Combine all the ingredients; drop from a teaspoon on to a buttered tin and bake in a moderate oven.

Honey Bran Cookies No. 2.

3 cups bran.
½ cup sugar.
½ to ¾ teaspoon soda.
½ teaspoon cinnamon.
½ teaspoon ginger.
½ cup honey.
½ cup milk.
½ cup melted butter.

Mix the sugar, cinnamon, ginger, and soda with the bran and add the other ingredients. Drop from a spoon upon a buttered pan and bake about 15 minutes.

Rolled Honey Wafers No. 1.

¼ cup butter.
⅔ cup honey.
⅞ cup flour.
½ teaspoon powdered cardamom or aniseed.

Mix together the butter and honey and add the flour, sifted with the spice. Spread out very thin with a broad long-bladed knife or spatula on a buttered, inverted dripping pan, or on flat tins made for the purpose. Mark off in 3-inch squares and bake in a slow oven until delicately browned. While warm, roll into tubular shape and hold until they cool and, if necessary, until they harden into shape. Honey wafers are not quite so tender as those made with sugar.

Rolled Honey Wafers No. 2.

¼ cup honey.
¼ cup sugar.
¼ cup butter.
⅞ cup flour.
⅛ cup milk.
¼ teaspoon cardamom or aniseed.

Cream the butter; add the sugar, honey, and flour in the order named, and the milk very gradually. Cook as rolled honey wafers No. 1.

Nougat Wafers.

½ cup butter.
1 cup brown sugar.
½ cup milk.
⅞ cup bread flour.
4 teaspoons ginger, or
2 teaspoons powdered cardamom or aniseed.

Rub together the butter and the sugar and add alternately the milk and the flour sifted with the spices. Spread in a very thin layer on the bottom of an inverted dripping pan or on flat tins made for the purpose. Mark off into pieces about an inch wide and 4 inches long and put together in pairs with honey nougat filling made as follows:

Honey filling for nougat wafers.

1 cup sugar.
½ cup honey.
¼ cup water.
2 egg whites.

Boil the sugar, water, and honey together until the sirup makes a thread when dropped from a spoon, or until drops of it hold their shape when poured into cold water. Beat the eggs to a stiff froth, pour the sirup over them, put the dish holding the mixture in a place where it will keep warm but not cook rapidly, beat until it will hold its shape.

Honey Rissoles.

Pastry covering for rissoles.

½ cup lard.
2 egg yolks.
1 egg white.
⅔ cup water.
¼ cup brown sugar.
Flour.

Mix together all the ingredients but the flour and add enough of that to make a stiff dough. Roll out as thin as a knife blade, cut into round or square pieces, taking care to avoid the necessity of rolling out the second time, as this is likely to make the dough very tough. A honey filling is used with this dough and is made as follows:

HONEY FILLING FOR RISSOLES.

1 cup honey.
2 ounces candied orange peel.
Rye bread crumbs.
Aniseed.

Bring the honey to the boiling point, remove from the stove, and add as much bread crumb as it will moisten while it is hot. Add the orange peel and enough powdered aniseed to give a decided flavor. Roll this filling into small balls and lay one in the center of each piece of pastry; fold the pastry over and press the edges together. Bake in a hot oven.

DESSERTS.

The following recipes suggest ways in which honey can be substituted for sugar or molasses in many common desserts. The ingenious cook with honey to spare can easily work out others if she remembers what was said on pages 11 and 12 about the sweetening power and water and acid content of honey:

BAKED HONEY CUSTARD.

5 eggs.
½ cup honey.
4 cups scalded milk.
½ teaspoon powdered cinnamon.
½ teaspoon salt.

Beat the eggs sufficiently to unite the yolks and whites, but not enough to make them foamy. Add the other ingredients and bake in cups or in a large pan in a moderate oven. The baking dishes should be set in water.

BOILED HONEY CUSTARD.

2 cups milk.
3 egg yolks.
½ cup honey.
½ teaspoon salt.

Mix the honey, eggs, and salt. Scald the milk and pour it over the eggs. Cook in a double boiler until the mixture thickens. This custard is suitable for use in place of cream on gelatin desserts, or to be poured over sliced oranges or stewed fruit.

HONEY PUDDING.

½ cup honey.
6 ounces bread crumbs.
½ cup milk.
Rind of half a lemon.
½ teaspoon ginger.
2 egg yolks.
2 tablespoons butter.
2 egg whites.

Mix the honey and the bread crumbs and add the milk, seasonings, and yolks of the eggs. Beat the mixture thoroughly and then add the butter and the whites of the eggs well beaten. Steam for about two hours in a pudding mold which is not more than three-quarters full.

HONEY CHARLOTTE RUSSE.

1 quart cream.
6 lady fingers.
½ cup delicately flavored honey.

Chill the honey by placing the dish containing it in a pan of ice water. Whip the cream and add it to the honey, mixing the two well. Line a dish with lady fingers and fill it with the honey and cream. Serve very cold.

HONEY MOUSSE.

4 eggs.
1 pint cream.
1 cup hot, delicately flavored honey.

Beat the eggs slightly and slowly pour over them the hot honey. Cook until the mixture thickens. When it is cool, add the cream whipped. Put the mixture into a mold, pack in salt and ice, and let it stand three or four hours.

Honey Ice Cream No. 1.

1 quart thin cream. ¾ cup delicately flavored honey.

Mix ingredients and freeze.

Honey Ice Cream No. 2.

1 pint milk. 1 cup honey.
Yolks 6 eggs. 1 pint cream.

Heat the milk in a double boiler. Beat together the honey and eggs, add the hot milk, return the mixture to the double boiler, and cook it until it thickens. Add the cream and when the mixture is cool, freeze it.

PRESERVED FRUITS.

Currants.

Bar-le-Duc currants, an article of commerce often made with honey, sell for a relatively high price, in part no doubt because of the large amount of labor involved in preparing them. The seeds are removed from the currants by a method which mutilates the fruit very slightly; the fruit is then preserved in honey or sugar sirup. Those who wish to take the time to preserve currants in this way will find that a convenient way to remove the seeds is to cut a small slit in the side of each currant and remove the seeds by means of a needle. After this is done, weigh the currants and take an equal weight of honey. Bring the honey to the boiling point, add the currants, and allow them to cook at the boiling point for two or three minutes, or until the skins are tender, being careful not to let the mixture boil violently because this is likely to destroy the shape of the fruit. If the currants are so juicy as to liquefy the honey too much, they may be removed and the sirup reduced to the desired consistency, after which the currants may be replaced.

It is possible, of course, to preserve currants in honey according to the same recipe without the removal of the seeds, but the preserve thus obtained is not nearly so delicate as when the seeds are removed.

Cranberries.

A very good preserve may be made from cranberries and honey which will remain in good condition for a long time. Take equal weights of cranberries, honey, and water. Cook the berries in the honey and water until the skins are soft. Remove the berries and boil down the sirup until just enough remains to cover the berries. Pour into glasses and cover as you would jelly. The appearance of the cranberries is improved if each one is pricked several times before cooking and if the cooking is slow at first. This gives the sirup an opportunity to penetrate the berries without destroying their form. A satisfactory method is to place all the ingredients in a double boiler and heat them very slowly. If this method is followed, the boiling down of the sirup is even more necessary than when the berries are cooked more rapidly.

Strawberries.

Take equal weights of strawberries and honey; mix the two and dry in the sun, or preferably in a warm oven; put into carefully sterilized glasses and cover with paraffin.

Apples.

2 quarts apples cut into small pieces. 1 cup vinegar.
2 cups honey. 1 teaspoon cinnamon.

Heat the honey, vinegar, and cinnamon together and cook the apples, a few at a time, in the sirup until they become transparent. Pour the sirup which remains after all the fruit is cooked over the apples.

Fruit and Honey Jelly

A good jelly may be made from winter apples and honey, using a cupful of honey to each cupful of apple juice and proceeding as in ordinary jelly-making. Honey could probably be used with other fruits suitable for jelly, but no definite directions have been worked out in this laboratory. The more delicately flavored honeys are probably best for this purpose, alfalfa giving an especially spicy taste.

ICING, SAUCES, CANDIES, ETC.

Honey Icing.

1 cup granulated sugar.
¼ cup water.
¼ cup honey.
1 egg white.

Boil together the sugar and the water for a few moments and then add the honey, taking precautions to prevent the mixture from boiling over, as it is likely to do. Cook until drops of the sirup keep their form when poured into cold water, or to about 250° F. Beat the white of the egg until stiff, and when the sirup has cooled slightly pour over the egg, beating the mixture continuously until it will hold its shape. This frosting is suitable for use between layers of cake, but is rather too soft for the top. It remains in good condition and soft enough to be spread for many weeks and, therefore, can be made in large quantities for use as needed. After eight months, such icing made in this laboratory was found to be in good condition and soft enough to cut.

Sauce for Ice Cream.

2 tablespoons butter.
2 teaspoons cornstarch.
½ cup honey.

Cook together the cornstarch and butter thoroughly, being careful not to brown them. Add the honey and cook the mixture until it becomes hard when dropped into cold water and until all taste of raw cornstarch has been removed.

Pudding Sauce.

If a small quantity of water be added to the above sauce, its consistency is entirely changed; it becomes thinner and can not be made brittle even by dropping it into cold water. It is suitable for serving on various kinds of puddings.

Strawberry Sauce.

Strawberry sauce, for puddings or boiled rice, which is usually made by mixing butter, sugar, and mashed berries, is a good means of securing the strawberry flavor at times when berries are too high-priced to be used in large quantities. The substitution of honey for sugar has proved to be practicable. In fact, it obviates one of the chief difficulties in making this sauce—the tendency to curdle.

2 tablespoons butter.
¾ cup mashed strawberries.
½ cup honey.

Beat together the honey and butter. Add the strawberries slowly, keeping the mixture cool by setting the dish in water. Serve on boiled rice or cottage pudding.

Salad Dressing.

4 egg yolks.
2 tablespoons vinegar or lemon juice.
2 tablespoons butter.
2 tablespoons honey.
1 teaspoon mustard.
1 teaspoon salt.
Paprika to taste.
1 cup cream.

Heat the cream in a double boiler. Beat the eggs, and add to them all the other ingredients but the cream. Pour the cream slowly over the mixture, beating constantly. Pour it into the double boiler and cook until it thickens, or mix all the ingredients but the cream and cook in a double boiler until the mixture thickens. As the dressing is needed combine this mixture with whipped cream. This dressing is particularly suitable for fruit salads.

Nougat.

½ cup honey.
½ cup brown sugar.
1 pound almonds.
2 egg whites.

Boil the honey and sugar together until drops of the mixture hold their shape when poured into cold water. Add the whites of the eggs, well beaten, and cook very slowly, stirring constantly, until the mixture becomes brittle when dropped into water. Add the almonds and cool under a weight. The candy can be broken into pieces, or may be cut and wrapped in waxed paper.

Honey Fudge.

2 cups sugar.
½ cup honey.
½ cup water.
2 egg whites.
1 teaspoon of vanilla extract.

Boil together the sugar, honey, and water until the sirup spins a thread when dropped from a spoon (about 250° F.). Pour the sirup over the well-beaten whites of the eggs, beating continuously and until the mixture crystallizes, adding the flavoring after the mixture has cooled a little. Drop in small pieces on buttered or paraffin paper. The vanilla may be omitted.

Honey Caramels.

2 cups granulated sugar.
½ cup cream or milk.
½ cup honey.
¼ cup butter.

Mix the ingredients; heat and stir until the sugar is dissolved; then cook without stirring until a firm ball can be formed from a little of the mixture dropped into cold water. Beat the mixture until it crystallizes, pour into buttered pans, and cut into squares. The addition of pecan nuts improves these caramels.

Honey Popcorn Balls.

Honey can be heated up to about 245° F. without being greatly changed in color or flavor. If it is heated carefully most of the water is expelled. The honey then becomes hard on cooling and can be used for making popcorn balls. To make them, dip the popped corn into the hot honey, shape into balls and cool. Honey popcorn balls absorb moisture on standing in the air. They must therefore be either kept very closely covered or reheated and dried before being used.

Reserve

HONEY AND ITS USES IN THE HOME

CAROLINE L. HUNT
Specialist in Food Preparation and Use
AND
HELEN W. ATWATER
Specialist in Home Economics

LIBRARY
RECEIVED
SEP 24 1919
U.S. Department of Agriculture

FARMERS' BULLETIN 653 (Rev.) Aug. 1919
UNITED STATES DEPARTMENT OF AGRICULTURE

Contribution from the States Relations Service
A. C. TRUE, Director

Rev.ed. follows

Washington, D. C. Issued April 7, 1915. Reprint, August, 1919

Show this bulletin to a neighbor. Additional copies may be obtained free from the Division of Publications, United States Department of Agriculture

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1919

HONEY is a sweet, old as the race, and always held in esteem. The flavor and aroma vary with the predominating kind of flower which the bees visit, and one can take advantage of this when selecting honey for the table, either to get a favorite flavor or to get variety by choosing different flavors.

Besides its uses for table purposes, honey is much used in cooking to replace all or part of the sugar called for by a recipe. A general rule in such cases is to use a cup of honey in place of a cup of sugar and to cut down the water or other liquid by one-fourth cup for each cup of honey used, to make up for the water in the honey.

The purpose which honey serves in the diet is like that of sugar—it is a source of energy in readily available form, and a flavor food which has many uses by itself and which adds to the palatability of other foods.

Besides discussing the nature and food value of honey, its place in the diet and related questions, this bulletin gives many suggestions and recipes for using honey in the home.

Beekeeping is an industry which is worthy of increased development, since it meets the growing demand for this palatable and wholesome food.

HONEY AND ITS USES IN THE HOME.

CONTENTS.

	Page.		Page.
Ingredients of honey	3	Honey in cookery	11
Food value of honey	4	Bread and muffins	15
Flavor of honey	6	Cakes, cookies, etc	16
Wholesomeness	7	Desserts	23
Economy of honey as food	8	Preserved fruits	24
Uses of honey	10	Icing, sauces, candies, etc	25

INGREDIENTS OF HONEY.

IN THE DAYS before trade with the Tropics introduced cane sugar into temperate regions honey was by far the most common sweet substance available for human food. In very early times men discovered that the material deposited by honeybees in hollow trees and in the crevices of rocks was a valuable and agreeable food and learned to appropriate it to their own use. Such wild honey is still gathered in Palestine and in the less advanced parts of Africa, in Asia, and in South and Central America, that from Peru making an important article of export. Bee trees, which were considered a prize in pioneer times in this country, are still valued in some remote rural regions, and not infrequently people living in country or village take the comb from a colony of bees which has settled in a corner under the weatherboarding of a building or some similar place.

There are two kinds of natural honey, known as floral, or normal, and honeydew, or abnormal, the former being made from nectar, a sweet liquid secreted by flowers, and the latter from honeydew, a sweet substance deposited on the leaves of plants by plant lice and other insects. Unless otherwise stated, the term "honey" when used in this bulletin may be understood to refer to the kind made from nectar, or to that in which the quantity of honeydew is so small that it does not greatly affect the character of the product.

The chief materials that the worker bees bring to the hive are nectar, pollen, and propolis. They collect the pollen on the hairs on their bodies, place it in the so-called pollen baskets on their legs, and thus carry it back to the hive to be deposited near the brood cells. This pollen is rich in nitrogenous material and is important as food for the young and developing bees (larvæ). A few grains usually find their way into the honey cells. Propolis or bee glue is obtained from the gums exuding from trees and shrubs. It is taken to the hive in the same way as pollen and is used to make the hive water-

proof and sometimes to strengthen the edges of the comb. If any gets on the capping of the honey it tends to spoil the appearance of the combs; these traces of propolis are known as "travel stain."

Nectar is the material from which honey is made. The bees suck it out of the flower with their long tongues and swallow it into the honey sac where it undergoes some changes not yet well understood. It consists chiefly of sugar and water, the former constituting usually between one-fifth and two-fifths of the entire weight and the latter between three-fifths and four-fifths. With this substance are mixed small quantities of other materials, chiefly mineral matters, gums, and volatile bodies. To the latter the aroma and flavor of honey are chiefly due.

The changes by means of which nectar is transformed into the finished honey are technically known as "ripening." They take place partly in the honey sac of the bee, and partly in the cells of the comb, continuing even after the latter have been capped with wax. They consist mainly in removal of part of the water from the nectar, a task which the bees accomplish by warming the air of the hives and also by fanning the nectar in the cells, and in the change in the chemical nature of the sugars, which will be described later (see p. 7).

Wax is made in and secreted from special glands on the abdomen of the worker bee. Several pounds of honey are used in producing a pound of wax, and a high temperature must be kept up in the hive by the bees while it is being made. Because of the cost of wax secretion beekeepers usually try to arrange that the bees shall have little comb building to do except when comb honey is being produced.

FOOD VALUE OF HONEY.

So far as its food value is concerned honey may be roughly described as a sirup with a distinctive flavor and aroma made up of 4 parts sugar to 1 part water. There are several kinds of sugars present in honey, including cane sugar (sucrose), grape sugar (dextrose), and fruit sugar (levulose); the last two together being called invert sugar. Some dextrin is also present as well as a variety of other substances in very small amounts. Included among them are nitrogenous substances (protein), which occur in quantities too minute to affect the food value of honey for man. Some of the other substances present in minute quantity, namely, volatile oils, or other bodies of pronounced odor or flavor from the nectar, are valuable because they influence the flavor and aroma of the honey.

According to data gathered by the Bureau of Chemistry[1] honey, on an average, contains in round numbers per 100 parts 18 parts water, 78 parts carbohydrate (including 76 parts sugar and 2 parts dextrin), 0.2 part mineral substance, or ash, and nearly 4 parts of undetermined substances such as pollen grain, gum, bee glue, formic

[1] U. S. Dept. Agr., Bur. Chem. Bul. 110.

acid and volatile oils, and other flavor substances. These are average values, and there is, of course, considerable variation in individual honeys. For instance, the proportion of water varies from about one-eighth to one-fourth of the total weight of the honey, being influenced by the moisture in the air at the time the honey is produced and the dryness of the atmosphere in which the honey is kept afterwards. Samples of honey from conspicuously dry localities (the southwestern part of the United States, for instance) and honeys made in other localities in very dry weather have a relatively low water content.

Honey contains a small amount of mineral matter, including magnesia, lime, iron, and phosphoric acid. In this respect it resembles maple sirup and unrefined sugar rather than white sugar, from which the mineral substances originally present in the plant juices have been removed in the course of the refining process. These mineral substances do not exceed more than 1 part per 100 of the weight of the honey and for this reason do not contribute greatly to the total mineral matter of the diet even when honey is used freely. They are not, however, to be wholly disregarded, for mineral substances, particularly lime, are likely to run low unless the food materials of the diet are carefully selected. A very little vitamin has been found in honey but not enough to be significant in an ordinary mixed diet.

The percentage of the different sugars varies more or less, but under any circumstance the amount of cane sugar is small (some 2 parts per 100) and less than in the nectar from which the honey is made. The proportion of dextrose (grape sugar) and levulose (fruit sugar) making up the total invert sugar varies in honey as it does in the nectar from which it is made, but this is of no importance in planning meals. However, it is of practical importance for the reason that it determines the character and appearance of the honey. Honey will granulate easily if the proportion of dextrose is large, but this is not the case if levulose predominates. For example, alfalfa honey, which contains a high percentage of dextrose, often forms such a solid mass of crystals that it is sold in cakes. This may be an advantage sometimes. Thus, the solid alfalfa honey can be used for such purposes as filling for layer cakes, for which liquid honey would not be so suitable because it would run out. The proportion of dextrin present in normal or nectar honey is so small that it affects neither food nor cooking values. Abnormal or honeydew honey, however, contains so much dextrin that it requires special handling in cooking. This is a matter of interest to professional bakers rather than to housekeepers, as such honey is not commonly used in the home.

Since the principal ingredient of honey is sugar, it is obvious that it should be classed with the fuel foods which supply the body with the energy it needs for the various tasks it performs rather than

those whose function is to build and repair the body—that is, the "tissue formers," as they are sometimes called. If honey contained no water its energy value would be practically the same, pound for pound, as that of cane sugar. However, since about one-fifth of its total weight is water, it follows that its energy value is one-fifth less than that of cane sugar, being 1,485 calories per pound.

In planning meals, particularly in hospitals, children's homes, and other institutions where large quantities are required, it is often convenient to have some quick and fairly accurate method of estimating the relative value of different articles of diet which are used in similar ways. For this reason it is worth remembering that an ordinary tablespoonful of honey weighs a trifle over an ounce and will furnish the body 100 calories. The same amount of energy would be supplied by five-sixths of an ounce of sugar, by 1¼ ounces of molasses, or by a little less than an ounce of preserves (such as orange marmalade).

FLAVOR OF HONEY.

Besides an intense sweet taste, honey retains enough of the perfume of the flowers from which it comes to have a distinctive flavor which has always set it apart as a food to be prized.

The flavor and aroma of honey depend largely upon the blossoms from which the nectar is obtained. The nectar of each kind of flower contains a distinctive combination of oils and other substances which gives the blossoms their special fragrance, and these substances are retained in the honey made from the nectar. It is practically impossible to prevent bees from visiting more than one kind of flower during a given period, and, strictly speaking, almost every kind of honey is made from a mixture of different nectars. Nevertheless, when the hives are situated near a large supply of one sort of blossom, its nectar usually predominates and its flavor and aroma can be easily recognized in the honey. It is perfectly correct, therefore, to speak of basswood honey, fruit-blossom honey, buckwheat honey, etc.

Different localities naturally produce different kinds of honey, and different kinds may be produced in the same locality at different seasons, according to the kinds of flowers which abound. Several famous European honeys, among them the choice French variety from Narbonne, owe their characteristic aromatic flavor to wild thyme and other flowers of the mint family. In orange honey from districts where orange blossoms abound the peculiar aroma and flavor of the flowers are very clearly marked. Sage and clover honeys are well-known American varieties in which the characteristics of the nectar are easily and pleasantly recognized.

Choosing between honey from different flowers is mainly a matter of taste; and taste in honey, as in many other things, seems to depend more on what one has been accustomed to than on any real supe-

riority. For example, it sometimes happens that a person who has always used buckwheat honey with its full-bodied, rather acid flavor, imagines that a mild, light honey with less of the characteristic "comby" taste must be adulterated, whereas a person who is familiar only with some such delicate honey as white clover or alfalfa may consider buckwheat very inferior, or even fancy that it is not genuine floral honey.

The relative abundance of different flowers and consequently the flavor of the honey vary so greatly in different seasons that beekeepers can not count on a regular yield of uniform honey, so one should not think it strange if the honey of one year is different from that of the year before. To overcome this difficulty many of the best wholesale dealers have recently adopted the practice of mixing several honeys to produce a blend. This process is like that adopted long ago in the case of teas. To blend honeys so that the mixture will be generally acceptable requires a great deal of skill, but when the consumer has found a blend which pleases him he is more likely to be able to get honey of that flavor season after season than if he depends on unmixed honeys.

WHOLESOMENESS.

That honey is a satisfactory and wholesome foodstuff is attested by its general acceptance as such wherever and whenever it can be obtained. Special properties and virtues have even been assigned to it in some cases.

Because the chemical change effected by the bee in the sugars of the nectar is the same as that effected by digestive ferments, and the principal sugars may therefore be considered to have undergone the first step of digestion, honey is often said to contain predigested sugar and to be more wholesome than cane sugar. There is no reason, however, to believe that the healthy human body is not equal to the task of digesting any sugar, so a special claim made for the wholesomeness of honey on this ground seems unimportant. It is generally believed that the energy from sugar is liberated for the use of the body more quickly than that from such other fuel foods as starch and fat. Hence it is said to delay the oncoming of fatigue during great muscular exertion. For this reason some form of sweet is included in almost all army rations and is often used by persons undergoing severe physical exertion, such as mountaineers and athletes. Although no experiments have been made to test the value of honey in this respect, it seems safe to say that it would have the same good effect as other sweets.

Everyone knows that eating too much ordinary sugar upsets digestion. The differences in the effects of too much honey and too much cane sugar are rather complicated, but it is safe to say that eating too much of either should be avoided, even by healthy people.

For some persons suffering from serious digestive disturbance honey may be a safer form of sugar than cane sugar, but with other forms of indigestion the opposite is true; it depends upon the particular form of disturbance, and such matters should be decided by a skillful physician for each individual case. For persons of very delicate digestion the particles of wax in comb honey may cause trouble, as it is believed that the digestive processes do not have any effect on them. For normal persons, however, the wax should be as harmless as are the particles of indigestible material contained in many other wholesome foods.

Honey is sometimes said to have a mildly laxative effect, and the statement is doubtless true, as it is of many other food materials, especially those of vegetable origin. If a person had to live on a very limited number of foods, especially if he had a tendency to constipation, it might be wise to use honey rather generally in preference to other forms of sweet; but the effect of such small amounts of honey as would be used in an ordinary diet would hardly be worth taking into consideration. Bran biscuits made with honey instead of sugar (see p. 16) would owe any advantage they might have over the ordinary bran biscuit to the laxative effect of the honey.

Other medicinal qualities have been claimed for honey, particularly in older writings, and it still finds use in medicinal preparations, but no doubt more because of tradition and of the flavor and texture it imparts than for actual medicinal properties. From the standpoint of the honey industry this is a matter of little importance, for honey is regarded by the vast majority of its users as a food and not as a drug product.

As a matter of fact, honey does not need the specific medicinal properties attributed to it to hold its place as a wholesome, useful foodstuff, well worthy of even more extended use than it already has, not only because it is agreeable and economical in itself, but also because it introduces a pleasing variety and thus makes the diet more appetizing, and consequently more wholesome.

ECONOMY OF HONEY AS FOOD.

In comparing foods for the purpose of determining which is more economical, it is necessary to take into account not only the relative prices per pound but also the amounts and kinds of nourishment they furnish. Honey, which contains little besides sugar, and is therefore useful chiefly as fuel for the body, can not be substituted in the diet for such foods as milk, eggs, and meat, which furnish not only fuel but also material for making body protein. The relative prices of honey and of milk, eggs, or meat, therefore, have little significance. Honey, however, can be used as a substitute for sugar and to a certain extent as a substitute for fat. Its fuel value per pound is about four-fifths that of sugar and nearly one-half that of butter.

Where honey is home-produced or very abundant locally at favorable prices, it can and does replace sugar for many household purposes. However, its distinctive flavor as well as its sweetening power and energy value are factors which should be kept in mind when comparing its relative cost, for in this respect it compares with maple sirup and maple sugar, which have a distinctive flavor, rather than with ordinary sugar.

The differences between the wholesale prices of comb honey and of extracted honey are much greater than those between the retail prices. A pound of extracted honey in a jar usually sells at retail for about the same as the average section of comb honey, which has a net weight of 14 ounces. On the other hand, the wholesale price of comb honey is usually about 50 per cent higher than that of extracted honey. The reason for this is that the producer of comb honey does far more of the work of getting his product ready for the final market than does the producer of extracted honey. As the sections leave his hands so they are passed over the counter to the housewife or other retail purchaser. Extracted honey, on the contrary, is sold by the producer to the bottler, not in pound lots but in 5-gallon cans or barrels. The bottler does the work of blending, liquefying, bottling, labeling, and packing. It is possible, therefore, for the consumer to save money by buying extracted honey at wholesale and avoiding the cost of the various kinds of work which prepare it for the retail market.

Where only small quantities of honey are used, the effort to buy in the cheapest market may cost more in energy than it saves in money. Where, however, large supplies are bought, the purchaser should try to get into direct communication with the producer and take advantage of the parcels post as a means of transportation. The names of dealers in his vicinity can often be obtained from the bee-keepers' magazines, or by writing to the State inspector of apiaries. The names of State inspectors and often those of local dealers can be obtained by addressing the Bureau of Entomology of the United States Department of Agriculture.

Now that extracted honey is usually pure and of good quality, the advantage of comb honey lies chiefly in its attractiveness to the eye. Unless very great care is taken in extracting honey, some of the volatile bodies on which its flavor depends will probably be lost. Hence it often happens that the flavor of comb honey is really slightly superior to the same kind extracted. Many persons think that the presence of the wax gives the honey a more pleasant consistency for table use. Whether these advantages are worth the extra cost each consumer must decide for himself.

Comb honey is commonly graded according to finish and color. It is described as Extra Fancy, Fancy, No. 1, or No. 2, according to the evenness with which the sections are filled, the freedom of the product

from propolis or other stains, and the number of unsealed cells. It is graded according to color, as white, light amber, amber, and dark. From the point of view of food value alone, finish and color are not of importance, though dark honeys are usually of stronger flavor.

In order to comply with the Federal Food and Drugs Act, which applies to all goods shipped from one State to another, every section of honey and every package containing extracted honey must be marked with the net weight. In comb honey this is understood to be the weight of the comb and the honey and to exclude the weight of the wooden frame.

In choosing honey too much importance should not be attached to lightness of color, for some of the best varieties are dark; nor should granulation be thought to imply adulteration. The truth is that crystallization is more likely to occur in pure than in impure honeys, and some pure varieties, especially alfalfa honeys, granulate so easily that they are often sold to the consumer in solid form. The crystals can easily be dissolved by heating the honey, which should be done in a double boiler or other kind of water bath. If the temperature does not go beyond 160° Fahrenheit, there is little danger that either color or flavor will be affected.

Unless in a sealed package, honey should be kept in a dry place; otherwise it is likely to absorb moisture and spoil, for when dilute it will ferment or sour readily, as will any other similar sugar sirup. Heat and dryness are usually found together in the household, and ordinarily the safest places for honey are the warmest places; the least desirable is the refrigerator.

USES OF HONEY.

In its natural state honey is often served much as jelly, jams, and conserves are, and because of its delicate flavor and its sweet taste it is especially adapted for this purpose. This is only one of its many uses, however, for it can be combined with many other foods to form attractive dishes in great variety, and for this reason deservedly ranks as a staple food.

Honey is used both in its natural state and as an ingredient of cooked food. In this country it is more commonly used uncooked than cooked, and practically all comb honey is consumed in this way. Honey is much more commonly used in cookery in Europe than in America, though commercial bakers and confectioners in the United States use much larger quantities than many persons realize.

The simplest way of using honey is to serve it like jam or sirup with bread, breakfast cereals, boiled rice, pancakes, and other mild-flavored foods. As ordinarily used on bread, an ounce of honey "spreads" as many slices as an ounce of jam. When it is to be used in the place of sirup, some people dilute it by mixing it with hot water, which has the effect of making it not only less sweet but also easier to pour.

Honey or a homemade mixture of honey and sugar sirup can be satisfactorily used for sweetening lemonade and other fruit drinks. Sirup of any kind is more convenient for this purpose than undissolved sugar, and when charged water is to be added it has a further advantage since it has less tendency to expel the gas. It is the custom of many housewives to keep a homemade sirup for this purpose, particularly in hot weather, and variety can be secured by occasionally using honey.

Honey can be used in place of sugar for some kinds of preserving, and there is reason to believe that fruits cooked in it keep very well indeed. Bar-le-Duc currants, which form a very delicate and expensive article of commerce, are often made by cooking currants in honey. They are frequently served with cream cheese and crackers or other form of bread. A satisfactory substitute may be secured by serving honey and tart fruit, either cooked or uncooked, with cottage cheese and bread and butter. Three ounces of cottage cheese curd, two ounces of bread, two-thirds ounce of butter (either added to the curd or spread on the bread), two ounces of honey, and six ounces of strawberries or other watery fruit would make a reasonably well-balanced meal. Sometimes honey alone is served with cream cheese. Crisp crackers, spread with cream cheese and honey, form a good combination from the point of view of nutritive value and taste. Honey may be substituted for sugar in baking apples.

HONEY IN COOKERY.

Most housekeepers know that honey can be used in cookery, but not all realize in how many ways it can be served and of how many dishes it may form a part.

As a result of extended studies of honey and its place in the diet, some suggestions made for using honey and recipes are given for a variety of dishes in which it is used.

When used in cookery honey does not always produce the same effect as corresponding quantities of sugar or molasses, and the reasons for some of the differences between them are not well understood. Careful experiments with various types of honeys and honey recipes were therefore made as part of the experimental work on foods of the United States Department of Agriculture, in the hope of explaining such points, and all the recipes (pp. 15–26) were tested. Most of the facts stated in the following paragraphs were obtained in this way.

The fact that honey consists principally of sugar and water and is slightly acid suggests that it is a suitable substitute for molasses in cookery. As a matter of fact, it can be used in the place of molasses in all forms of breads, muffins, and cakes, and makes a more delicately flavored product. It contains less acid than molasses, however, and so requires less soda when it is substituted for molasses in recipes which do not include sour milk or other acid, and the cook

must be careful about the amount of soda used. Many trials were made with different kinds of honey in this laboratory which showed that the allowance of soda to a cupful of honey very generally ranges between one-fourth and one-half of a level teaspoonful. Unless the cook is thoroughly familiar with her honey, she would do well to mix and bake a small sample of dough before she decides on the amount of soda to be put into the main portion.

When honey is to be substituted for common sugar it is desirable to know not only how it compares in sweetness, but also how much allowance must be made for the water which it contains. Assuming a cupful of good honey to measure one-half pint, it should weigh about 12 ounces. Of this, 9 to 10 ounces, roughly speaking, is sugar. A cupful of honey, therefore, corresponds to a little more than a cupful of cane sugar. Hence it is safe to estimate that a cupful of honey will sweeten a dish just about as much as a cupful of sugar. Besides the sugars, there is about one-fifth of a cupful of water in a cupful of honey. Theoretically, therefore, in making cake one should substitute honey for sugar cupful for cupful, and for each cupful of honey use one-fifth cupful less of the milk or other liquid which the recipe calls for. For practical purposes, however, it is accurate enough to consider that the water in a cupful of honey is one-fourth of a cupful. This rule was found to hold good with a large number of ordinary cake recipes which were tested in this laboratory. These facts, if kept in mind, make special honey recipes unnecessary and enable the cook with very slight calculation to modify ordinary ones so that honey can be used in place of sugar. Besides slightly changing the flavor of the cake, honey used in the place of sugar makes it keep moist longer. A honey cake made with butter will keep its quality until the butter grows rancid, and one made without butter will keep fresh for months and even improve in flavor. What is true of the cakes is also true of the dough; it can be kept almost indefinitely. Evidently, then, honey is especially useful in recipes without butter. For this reason, most of the honey cakes experimentally studied in this laboratory were made according to the following formula which is typical of Honig Kuchen, or German Christmas cake: Three-fourths cup honey, one-half cup sugar, two cups or more flour, one-fourth teaspoon powdered ginger, one-half teaspoon powdered cardamom seed, one teaspoon cinnamon, one-eighth teaspoon cloves, a speck white pepper, a pinch salt, one-fourth to one-half teaspoon soda, one tablespoon water, and two ounces blanched almonds cut in small pieces or chopped.

The directions for making the honey cakes, not only in the older cookbooks, but also in many modern bakers' manuals, are extremely elaborate; one of the purposes of the experiments made in this

laboratory was to determine how many of the suggested precautions are necessary.

Recipes usually direct that the honey be brought to the boiling point and then skimmed and cooled. This must be done with great care, for the honey is very likely to boil over. Experiments with a large variety of honeys such as are ordinarily purchased in the United States for household use, showed that nothing rises to the top during the boiling which can not be easily stirred back into the liquid. It seems likely therefore that the custom of boiling had its origin at the time when honey, or at least the grades bakers use, was much less carefully prepared than at present and contained impurities of many kinds. A cake made by stirring flour directly into cold honey was found to be in no way inferior to those made with honey which had been heated.

Some recipes found in the older cook books, particularly those of foreign origin, direct that the spices be boiled with the honey and give as a reason for this that the heating brings out their flavor and makes them "go further." The weight of this argument is obviously difficult to determine, but the work carried out by the Department of Agriculture gave no evidence that the short heating at the beginning is of special importance in comparison with the long heating which the materials must receive while the cake is being baked.

The older recipes almost invariably direct that the dough be kept for a certain length of time, sometimes one day, sometimes more, before the soda is added. So reliable an authority as König says that this is because, owing to the presence of bacteria, the acidity of the mixture increases with time, and that therefore more soda can be used after the dough has stood. To test this point, dough was mixed in this laboratory and analyzed by the Bureau of Chemistry; it was found to have 0.0775 per cent of acidity immediately after being mixed, and 0.1 per cent after four days' time. Another sample increased in six days from 0.108 per cent to 0.117 per cent, and during the following six days to 0.125 per cent. It seems probable, therefore, that the acid does usually increase; but even so, the question arises whether there is not in the beginning enough acid to act on soda sufficient to raise the cake. In order to determine this, two samples of dough were mixed. To No. 1 the soda was added at once and baking followed immediately. No. 2 was kept for a week, when the soda was added and the cake was baked. The second was neither lighter nor in any way superior to the first.

It is frequently stated that the dough can be more easily kneaded if it is allowed to stand several days. In order to test this point, a dough was mixed which was stiff enough to hold its shape, but which stuck to the hands and the molding board. After a week's time it

could be molded freely on an unfloured board without sticking to it. This argument for keeping the dough seems therefore to be sound.

It is sometimes said that the reason why cakes made with honey keep soft for a long time is that they absorb moisture from the air. To test this point a cake made according to the recipe already given was weighed at different intervals during 7½ months. The weight of the dough was 526 grams, the weight of the cake on the day of baking, April 17, 1913, was 499 grams after it had been removed from the pan, and at the final weighing on December 2 of the same year, it weighed 469.7 grams. The loss of weight was continuous during all this time, with the exception that in the late summer there was a slight increase in the weight, probably due to unusual dampness of the air; this was followed by a relatively great loss. On December 2, when the cake was cut, it was in good condition, and had a fine flavor and the consistency of a soft cooky. The experiment was repeated with small honey cakes, and these also showed no increase in weight before softening. While these experiments are not sufficient for definite conclusions, they indicate that the increased softness of the honey cake is not due to the absorption of water.

Icing made with honey or with part honey and part sugar according to the recipe on page 25 has the same advantage that honey cakes have. Such icing made in this laboratory was found at the end of 10 months to be soft and in as good condition as when originally made. It would, therefore, seem to be suitable for cakes that are to be kept for a long time.

In most of the recipes in foreign cookbooks "potash" (potassium bicarbonate) is recommended for use with honey to raise the dough. This is very similar in its properties to ordinary baking soda (sodium bicarbonate) and seems to have no advantage over it for this purpose. Whatever may have been the conditions in earlier times in Europe, baking soda is a common kitchen commodity in most American homes, and the potassium bicarbonate is almost unknown for household purposes. Both the potassium bicarbonate and baking soda gave much better results in the honey recipes tested than did the baking powder, and naturally, since the acid honey calls for an alkali like soda rather than a mixture of acid and alkali such as baking powder. If baking powder were used it should be in addition to soda enough to neutralize the acid of the honey, not merely as a substitute for soda, just as housekeepers sometimes neutralize sour milk or molasses with soda and then add baking powder to raise the dough.

In the countries where honey cakes have come to perfection spices are used which are somewhat uncommon in this country, and it is reasonable to suppose that long experience has taught a good com-

bination of flavors. Cardamom seed, a rather old-fashioned flavor which is still sometimes found in candies, seems to combine more satisfactorily with the flavor of honey than some of the spices which are better known in our kitchens. It is best, however, to use it in combination with other flavoring materials. The following has been found to be a good combination:

Salt, 1 part by measure.
White pepper, 1 part.
Nutmeg, 2 parts.
Cloves, 2 parts.
Ginger, 4 parts.
Cardamom, 8 parts.
Cinnamon, 16 parts.

These should be thoroughly mixed and can be made up in quantity and kept ready for use.

Aniseed and coriander seed are also often used in honey cakes in combination with other spices. The following mixture is recommended in a baker's handbook,[1] the amounts given being suitable for 10 pounds of dough:

2 ounces ground cinnamon.
½ ounce ground cloves.
2 ounces aniseed.
1 ounce finely ground coriander seed.

In considering the uses of honey in cookery, it is well to remember that it owes its flavor to bodies which are very volatile and that for this reason it should not be heated unnecessarily hot or unnecessarily long.

In order to learn how honey is used in cookery, standard cookbooks from many countries were examined and many persons familiar with honey cookery were consulted. Innumerable as the recipes were, it was soon found that they belonged mainly to only a few different types, such as breads made with honey, honey cakes made with or without butter, fruits preserved in honey, and sauces and candies made with honey. Many recipes were tested in this laboratory, and some of the more desirable ones were adapted for use in the United States and are published here.

BREAD AND MUFFINS.

Honey is not often used in bread making but there is no reason why it may not be used in yeast bread as food for the yeast plant or be substituted for molasses or sugar in varieties of bread which call for such sweetening. A few recipes are here given.

Bran Brown Bread.

1 cup white or whole wheat flour.
1 teaspoon soda.
½ teaspoon salt.
1 cup bran.
½ cup honey.
1 cup sour milk.
½ cup raisins floured.

[1] The Twentieth Century Book for the Progressive Baker. By F. L. Gienandt. Boston, 1913, p. 120.

Sift together the flour, soda, and salt, and add the other ingredients. Steam three hours or bake 40 minutes in a slow oven. If the amount of milk is increased by half, the bread is more delicate and has a somewhat higher food value.

Steamed Brown Bread.

1 cup yellow corn meal.
2 cups graham flour.
¾ cup honey.
2 cups sour milk.
1 teaspoon salt.
1½ teaspoons soda.
1 tablespoon boiling water.
1 cup seeded raisins.

Mix together the meal, flour, and salt; add the sour milk and the honey and then the soda dissolved in the boiling water; and the raisins. Steam three hours in covered receptacles, which should be not more than two-thirds full at the beginning of the cooking.

Honey Bread.

2 cups honey.
4 cups rye flour.
1 teaspoon soda.
4 teaspoons aniseed.
2 teaspoons ginger.
4 teaspoons powered cardamom seed.
2 egg yolks.
½ cup brown sugar.

Sift the flour with the spices and soda and add the other ingredients. Put the dough into shallow buttered pans to the depth of about an inch and bake in a hot oven.

Honey and Nut Bran Muffins.

½ cup honey.
1 cup flour.
½ to ½ teaspoon soda.
½ teaspoon salt.
2 cups bran.
1 tablespoon melted butter.
1½ cups milk.
¾ cup finely chopped English walnuts.

Sift together the flour, soda, and salt, and mix them with the bran. Add the other ingredients and bake for 25 or 30 minutes in a hot oven in gem tins. This will make about 16 large muffins, each of which may be considered roughly to be a 100-calorie portion and to contain 2 grams of protein.

Honey and Nut Sandwiches.

Mix the honey with pecan meats or almonds minced, and make into sandwiches with small baking-powder biscuits.

Honey and Cream Cheese Sandwiches.

Mix honey with cream cheese and use as filling for bread or baking-powder biscuit sandwiches. Chopped nut may be added to the honey and cheese if desired.

CAKES, COOKIES, ETC.

By far the most general use of honey in cookery is for cakes. Of these there is an almost endless variety, from rich fruit cake in loaves or elaborate pastries with honey filling to simple cookies. As has been pointed out, the honey flavor combines especially well with spices. The presence of honey also makes the cakes keep fresh longer. These two facts probably explain why the honey cakes, which belong mainly to the general order of gingerbreads or spice

cakes, are so largely produced by commercial bakers. Many of these are rather elaborate to make, and for that reason some of the simpler kinds of honey cakes may be preferred by the busy housekeeper.

Hard Honey Cake.

¾ cup honey.
½ cup sugar.
2½ cups flour.
1 egg.
¼ teaspoon ginger.
1 teaspoon cinnamon.
½ teaspoon ground cardamom seed.
½ teaspoon cloves.
Speck white pepper.
Speck salt.
½ teaspoon soda.
1 tablespoon water.
2 ounces blanched almonds cut into small pieces or chopped

Sift together the flour and spices, dissolve the soda in the water, beat the egg and combine all the ingredients. Beat or knead the mixture thoroughly. Cook a small sample. If it does not rise sufficiently, add a little more soda and honey; if it falls, add a little more flour. Roll out the dough to the thickness of about three-fourths of an inch and bake in a hot oven. When the cake is done glaze it with a thick sirup of sugar and water and allow it to dry in a slow oven or in some other warm place. While it is still warm, cut it into long strips. Or it may be left in one large cake, to be cut into very thin slices when served. This cake will become very hard on cooling and will not be soft enough to eat for several weeks, but will keep in good condition for an indefinite length of time.

Butter Honey Cake.

1½ cups honey.
½ cup butter.
3 egg yolks.
5 cups flour.
2 teaspoons ground cinnamon.
½ teaspoon salt.
1½ teaspoons soda.
2 tablespoons orange-flower water (water may be substituted).
Whites 3 eggs.

Rub together the honey and butter; add the unbeaten yolks and beat thoroughly. Add the flour sifted with the cinnamon and the salt; and the soda dissolved in the orange-flower water. Beat the mixture thoroughly and add the well-beaten whites of the eggs. Bake in shallow tins and cover with frosting made as follows:

Orange frosting for butter honey cake.

Grated rind 1 orange.
1 teaspoon lemon juice.
1 tablespoon orange juice.
1 egg yolk.
Confectioners' sugar.

Mix all ingredients but the sugar and allow the mixture to stand for an hour. Strain and add confectioners' sugar until the frosting is sufficiently thick to be spread on the cake.

For the cinnamon in the Butter Honey Cake the following mixture of spices may be substituted:

½ teaspoon ginger.
2 teaspoons cinnamon.
1 teaspoon ground cardamom seed.
1 teaspoon cloves.
¼ teaspoon nutmeg.
¼ teaspoon white pepper.
Chopped citron or nuts may also be added.

This mixture may also be flavored with ginger, aniseed, or cardamom seed.

Butter Honey Cake No. 2.

1 cup honey.
½ cup butter.
½ teaspoon ginger.
½ teaspoon cinnamon.
1 teaspoon ground cardamom seed.
3 eggs.
3 cups flour.
½ to 1 teaspoon soda.
1 ounce candied orange peel.
1 ounce candied lemon peel, or
1 cup seeded raisins.

Mix the honey and butter by warming slightly and stirring; add the spices and the yolks of the eggs unbeaten and beat the mixture thoroughly. Add the flour and the soda dissolved in a little water, then the whites of the eggs beaten stiff, and finally the fruit. Bake in a moderate oven.

Nut Honey Cake.

2 cups brown sugar.
2 cups honey.
6 egg yolks.
3 cups flour.
Speck of salt.
1½ teaspoons soda.
3 teaspoons ground cinnamon.
½ teaspoon ground cloves.
½ teaspoon ground nutmeg.
½ teaspoon allspice.
1 cup chopped raisins.
½ ounce citron cut in small pieces.
½ ounce candied orange peel cut in small pieces.
½ pound almonds coarsely chopped.
Whites of 3 eggs.

Mix the sugar, honey, and the yolks of the eggs, and beat thoroughly. Sift together the flour, salt, spices, and soda. Combine all ingredients but the whites of the eggs. Beat the whites of the eggs till they are stiff and add them last. Pour the dough to the depth of about half an inch into well-buttered tins, and bake in a slow oven for one-half hour.

Frosting for Nut Honey Cake.

1½ cups sugar.
3 egg whites.
½ cup water.

Boil the sugar and water until the sirup forms a thread when dropped from the spoon. While still hot, pour the sirup over the well-beaten whites of the eggs, beating the mixture until it is of the right consistency to spread.

Chocolate Nut Honey Cake.

To the above cake add 3 ounces of chocolate grated.

Soft Honey Cake.

½ cup butter.
1 cup honey.
1 egg.
½ cup sour milk.
1 teaspoon soda.
½ teaspoon cinnamon.
½ teaspoon ginger.
4 cups flour.

Rub the butter and honey together; add the egg well beaten, then the sour milk and the flour sifted with the soda and spices. Bake in a shallow pan.

Honey Sponge Cake.

½ cup sugar.
½ cup honey.
4 eggs.
1 cup sifted flour.

Mix the sugar and honey and boil until the sirup will spin a thread when dropped from the spoon. Pour the sirup over the yokes of the eggs which have been beaten

until light. Beat this mixture until cold; then add the flour, and cut and fold the beaten whites of the eggs into the mixture. Bake for 40 or 50 minutes in a pan lined with buttered paper, in a slow oven.

This cake can be made with a cupful of unheated honey in place of the honey and sugar sirup, but the quality is not quite so good.

Honey Pound Cake.

A good pound cake can be made by using equal weights of honey, sugar, eggs, flour, and butter. A little soda should be added because of the acidity of the honey, and a good flavoring is cardamom seed and orange-flower water. Or a cake similar to pound cake may be made as follows:

1 cup sugar.
¾ cup honey.
1 cup butter.
4 eggs.
2 cups pastry flour.
½ teaspoon powdered cardamom seed.
½ teaspoon soda.
½ teaspoon orange-flower water.

Rub together the butter and sugar, and add the honey. Add the yolks of the eggs well beaten. Finally, add the whites of the eggs, beaten to a stiff froth, and the orange-flower water. Add gradually the flour sifted with the soda and cardamom seed. Beat the mixture for 10 minutes. Put the dough into a warm tin with high sides, and bake in a slow oven one hour.

Ribbon Cake.

UTILIZING CANDIED HONEY AS FILLING.

½ cup butter.
2 cups sugar.
4 eggs.
1 cup milk.
3½ cups flour.
5 teaspoons baking powder.
1½ teaspoons ground cardamom seed.
1½ teaspoons ginger.
¾ teaspoon cinnamon.
¼ teaspoon cloves.
½ cup raisins, seeded and cut in pieces.
½ cup figs, finely chopped.
1 tablespoon honey.

Rub the butter and sugar together and add the yolks of the eggs. Sift together the flour and baking powder and add them to the mixture, alternating them with the milk. Finally, add the whites of the eggs well beaten. Bake two-thirds of the mixture in two layer-cake pans. To the remainder add spices, fruit, and honey, and bake in a layer-cake pan. Put layers together with crystallized honey.

Honey Fruit Cake.

3 cups flour.
2 teaspoons soda.
3½ cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed
½ teaspoon cloves.
3 pounds raisins (seeded).
1½ pounds currants.
1 pound citron.
1 pound candied cherries.
1 pound candied apricots.
1 pound candied pineapple.
½ cup sour jelly, or
½ cup white grape juice.
2 teaspoons vanilla.
2 ounces candied orange peel.
2 ounces candied lemon peel.

Cut the candied fruit into small pieces, with the exception of the cherries, which should be left whole. Place the fruit in a large dish and sift over it one-half of the flour, mixing thoroughly. Sift the soda with the remainder of the flour. Bring the honey and the butter to boiling point and while still hot add the spices. When the mixture is cool, add the well-beaten yolks of the eggs, then the flour and grape juice or jelly and the well-beaten whites. Finally, add the fruit. The cake should be divided into three or four parts and put into buttered dishes covered with buttered paper tied closely over the tops. Steam for five hours, remove the paper, and bake in a very slow oven for an hour. This makes a very rich cake consisting chiefly of fruit. For the sake of economy, the flour can be increased to even twice the quantity without affecting the quality very much.

Honey Fruit Cake No. 2.

4 cups flour.
3 teaspoons soda.
2 cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed.
½ teaspoon cloves.
3 pound raisins (seeded).
4 ounces citron.
1 pound cranberries.
1 pound canned pineapple.
1 pound dried apricots.
1 pound dried apples.

To prepare the cranberries, pineapples, apricots, and apples, cook each in honey till it is soft; remove from the honey and dry in a very slow oven. A little water should be added to the honey in which the cranberries are cooked, a good proportion of ingredients being equal weights of cranberries, water, and honey. To any honey left over from cooking the fruits add enough honey to make up the total amount called for by the recipe. Mix and cook the cake in the same manner as honey fruit cake No. 1.

Honey Drop Cakes.

¾ cup honey.
¼ cup butter.
½ teaspoon cinnamon.
½ teaspoon cloves.
1 egg.
1½ to 2 cups flour.
½ teaspoon soda.
2 tablespoons water.
1 cup raisins, cut into small pieces.

Heat the honey and butter until the butter melts. While the mixture is warm add the spices. When it is cold add part of the flour, the egg well beaten, the soda dissolved in the water, and the raisins. Add enough more flour to make a dough that will hold its shape. Drop by spoonfuls on a buttered tin and bake in a moderate oven.

Yellow Honey Cake.

½ cup sugar.
2 egg yolks.
⅔ cup honey.
¼ teaspoon cinnamon.
¼ teaspoon cloves.
1½ cups flour.

Sift together the flour and the spices. Mix the sugar and egg yolks, add the honey, and then the flour gradually. Roll out thin, moisten the surface with egg white, and mark into small squares. Bake in a moderate oven.

Honey Cookies No. 1.

- ¾ cup honey.
- ¾ cup sugar.
- 2½ cups flour.
- ½ teaspoon soda.
- 1½ teaspoons cinnamon.
- 1 teaspoon cloves.
- 1 teaspoon allspice.
- 2 ounces finely chopped candied orange peel.
- ¼ pound walnut meats finely chopped.

Sift together the flour, spices, and soda, and add the other ingredients. Knead thoroughly, roll out thin, and cut with a biscuit cutter. These cookies are very hard.

Honey Cookies No. 2.

- ¼ cup honey.
- ¾ cup sugar.
- ½ cup milk.
- 3 tablespoons lard.
- 2 egg yolks.
- 4 cups flour.
- ½ teaspoon salt.
- 1 teaspoon ground cinnamon.
- ½ cup finely chopped almonds.
- ½ teaspoon soda or 2 teaspoons baking powder.

Bring the first four ingredients to the boiling point and allow the mixture to cool. Sift together the flour, cinnamon, and soda or baking powder. Combine all the ingredients. Roll the mixture out thin on a floured board. Cut out and bake in a moderate oven on tins which have been greased and floured. To prepare the tins properly, brush them over with melted butter and sifted flour, turn them over, and shake off as much as possible of the flour.

Honey Cookies No. 3.

- ¼ cup water.
- 1 pound brown sugar or 2 cups packed solidly.
- ½ cup lard.
- 1 cup honey.
- ½ cup egg yolks.
- 1 teaspoon soda.
- 6 cups flour.
- 1 teaspoon powdered cardamom seed.
- 1 teaspoon cinnamon.

Heat the water, sugar, lard, and honey until the lard is melted. When cool, add the yolks of the eggs and the flour, sifted with the soda, and spices. Roll out on a floured board and cut into any desired shape. Place a small piece of citron in the middle of each cooky.

Honey Bran Cookies No. 1.

- 2 tablespoons butter.
- ½ cup honey.
- 2 eggs.
- ¼ to ½ teaspoon soda.
- ½ cup flour.
- 1 cup bran.
- ½ teaspoon powdered aniseed.

Rub together the butter and honey; add the eggs unbeaten and beat the mixture thoroughly. Sift together the flour, soda, and aniseed. Combine all the ingredients; drop from a teaspoon on to a buttered tin and bake in a moderate oven.

Honey Bran Cookies No. 2.

- 3 cups bran.
- ½ cup sugar.
- ¼ to ½ teaspoon soda.
- ½ teaspoon cinnamon.
- ½ teaspoon ginger.
- ½ cup honey.
- ½ cup milk.
- ½ cup melted butter.

Mix the sugar, cinnamon, ginger, and soda with the bran and add the other ingredients. Drop from a spoon upon a buttered pan and bake about 15 minutes.

Rolled Honey Wafers No. 1.

½ cup butter.
½ cup honey.
½ cup flour.
½ teaspoon powdered cardamom or aniseed.

Mix together the butter and honey and add the flour, sifted with the spice. Spread out very thin with a broad long-bladed knife or spatula on a buttered, inverted dripping pan, or on flat tins made for the purpose. Mark off in 3-inch squares and bake in a slow oven until delicately browned. While warm, roll into tubular shape and hold until they cool and, if necessary, until they harden into shape. Honey wafers are not quite so tender as those made with sugar.

Rolled Honey Wafers No. 2.

½ cup honey.
½ cup sugar.
½ cup butter.
½ cup flour.
½ cup milk.
½ teaspoon cardamom or aniseed.

Cream the butter; add the sugar, honey, and flour in the order named, and the milk very gradually. Cook as rolled honey wafers No. 1.

Nougat Wafers.

½ cup butter.
1 cup brown sugar.
½ cup milk.
½ cup bread flour.
4 teaspoons ginger, or
2 teaspoons powdered cardamom or aniseed.

Rub together the butter and the sugar and add alternately the milk and the flour sifted with the spices. Spread in a very thin layer on the bottom of an inverted dripping pan or on flat tins made for the purpose. Mark off into pieces about an inch wide and 4 inches long and put together in pairs with honey nougat filling made as follows:

Honey filling for nougat wafers.

1 cup sugar.
½ cup honey.
½ cup water.
2 egg whites.

Boil the sugar, water, and honey together until the sirup makes a thread when dropped from a spoon, or until drops of it hold their shape when poured into cold water. Beat the eggs to a stiff froth, pour the sirup over them, put the dish holding the mixture in a place where it will keep warm but not cook rapidly, beat until it will hold its shape.

Honey Rissoles.

Pastry covering for rissoles.

½ cup lard.
2 egg yolks.
1 egg white.
⅔ cup water.
½ cup brown sugar.
Flour.

Mix together all the ingredients but the flour and add enough of that to make a stiff dough. Roll out as thin as a knife blade, cut into round or square pieces, taking care to avoid the necessity of rolling out the second time, as this is likely to make the dough very tough. A honey filling is used with this dough and is made as follows:

HONEY FILLING FOR RISSOLES.

1 cup honey.
2 ounces candied orange peel.
Rye bread crumbs.
Aniseed.

Bring the honey to the boiling point, remove from the stove, and add as much bread crumb as it will moisten while it is hot. Add the orange peel and enough powdered aniseed to give a decided flavor. Roll this filling into small balls and lay one in the center of each piece of pastry; fold the pastry over and press the edges together. Bake in a hot oven.

DESSERTS.

The following recipes suggest ways in which honey can be substituted for sugar or molasses in many common desserts. The ingenious cook with honey to spare can easily work out others if she remembers what was said on pages 11 and 12 about the sweetening power and water and acid content of honey:

BAKED HONEY CUSTARD.

5 eggs.
½ cup honey.
4 cups scalded milk.
¼ teaspoon powdered cinnamon.
¼ teaspoon salt.

Beat the eggs sufficiently to unite the yolks and whites, but not enough to make them foamy. Add the other ingredients and bake in cups or in a large pan in a moderate oven. The baking dishes should be set in water.

BOILED HONEY CUSTARD.

2 cups milk.
3 egg yolks.
½ cup honey.
¼ teaspoon salt.

Mix the honey, eggs, and salt. Scald the milk and pour it over the eggs. Cook in a double boiler until the mixture thickens. This custard is suitable for use in place of cream on gelatin desserts, or to be poured over sliced oranges or stewed fruit.

HONEY PUDDING.

½ cup honey.
6 ounces bread crumbs.
½ cup milk.
Rind of half a lemon.
½ teaspoon ginger.
2 egg yolks.
2 tablespoons butter.
2 egg whites.

Mix the honey and the bread crumbs and add the milk, seasonings, and yolks of the eggs. Beat the mixture thoroughly and then add the butter and the whites of the eggs well beaten. Steam for about two hours in a pudding mold which is not more than three-quarters full.

HONEY CHARLOTTE RUSSE.

1 quart cream.
6 lady fingers.
½ cup delicately flavored honey.

Chill the honey by placing the dish containing it in a pan of ice water. Whip the cream and add it to the honey, mixing the two well. Line a dish with lady fingers and fill it with the honey and cream. Serve very cold.

HONEY MOUSSE.

4 eggs.
1 pint cream.
1 cup hot, delicately flavored honey.

Beat the eggs slightly and slowly pour over them the hot honey. Cook until the mixture thickens. When it is cool, add the cream whipped. Put the mixture into a mold, pack in salt and ice, and let it stand three or four hours.

HONEY ICE CREAM NO. 1.

1 quart thin cream. ¾ cup delicately flavored honey.

Mix ingredients and freeze.

HONEY ICE CREAM NO. 2.

1 pint milk. 1 cup honey.
Yolks 6 eggs. 1 pint cream.

Heat the milk in a double boiler. Beat together the honey and eggs, add the hot milk, return the mixture to the double boiler, and cook it until it thickens. Add the cream and when the mixture is cool, freeze it.

PRESERVED FRUITS.

CURRANTS.

Bar-le-Duc currants, an article of commerce often made with honey, sell for a relatively high price, in part no doubt because of the large amount of labor involved in preparing them. The seeds are removed from the currants by a method which mutilates the fruit very slightly; the fruit is then preserved in honey or sugar sirup. Those who wish to take the time to preserve currants in this way will find that a convenient way to remove the seeds is to cut a small slit in the side of each currant and remove the seeds by means of a needle. After this is done, weigh the currants and take an equal weight of honey. Bring the honey to the boiling point, add the currants, and allow them to cook at the boiling point for two or three minutes, or until the skins are tender, being careful not to let the mixture boil violently because this is likely to destroy the shape of the fruit. If the currants are so juicy as to liquefy the honey too much, they may be removed and the sirup reduced to the desired consistency, after which the currants may be replaced.

It is possible, of course, to preserve currants in honey according to the same recipe without the removal of the seeds, but the preserve thus obtained is not nearly so delicate as when the seeds are removed.

CRANBERRIES.

A very good preserve may be made from cranberries and honey which will remain in good condition for a long time. Take equal weights of cranberries, honey, and water. Cook the berries in the honey and water until the skins are soft. Remove the berries and boil down the sirup until just enough remains to cover the berries. Pour into glasses and cover as you would jelly. The appearance of the cranberries is improved if each one is pricked several times before cooking and if the cooking is slow at first. This gives the sirup an opportunity to penetrate the berries without destroying their form. A satisfactory method is to place all the ingredients in a double boiler and heat them very slowly. If this method is followed, the boiling down of the sirup is even more necessary than when the berries are cooked more rapidly.

STRAWBERRIES.

Take equal weights of strawberries and honey; mix the two and dry in the sun, or preferably in a warm oven; put into carefully sterilized glasses and cover with paraffin.

APPLES.

2 quarts apples cut into small pieces. 1 cup vinegar.
2 cups honey. 1 teaspoon cinnamon.

Heat the honey, vinegar, and cinnamon together and cook the apples, a few at a time, in the sirup until they become transparent. Pour the sirup which remains after all the fruit is cooked over the apples.

Fruit and Honey Jelly.

A good jelly may be made from winter apples and honey, using a cupful of honey to each cupful of apple juice and proceeding as in ordinary jelly-making. Honey could probably be used with other fruits suitable for jelly, but no definite directions have been worked out in this laboratory. The more delicately flavored honeys are probably best for this purpose, alfalfa giving an especially spicy taste.

ICING, SAUCES, CANDIES, ETC.

Honey Icing.

1 cup granulated sugar.
¼ cup water.
¼ cup honey.
1 egg white.

Boil together the sugar and the water for a few moments and then add the honey, taking precautions to prevent the mixture from boiling over, as it is likely to do. Cook until drops of the sirup keep their form when poured into cold water, or to about 250° F. Beat the white of the egg until stiff, and when the sirup has cooled slightly pour over the egg, beating the mixture continuously until it will hold its shape. This frosting is suitable for use between layers of cake, but is rather too soft for the top. It remains in good condition and soft enough to be spread for many weeks and, therefore, can be made in large quantities for use as needed. After eight months, such icing made in this laboratory was found to be in good condition and soft enough to cut.

Sauce for Ice Cream.

2 tablespoons butter.
2 teaspoons cornstarch.
½ cup honey.

Cook together the cornstarch and butter thoroughly, being careful not to brown them. Add the honey and cook the mixture until it becomes hard when dropped into cold water and until all taste of raw cornstarch has been removed.

Pudding Sauce.

If a small quantity of water be added to the above sauce, its consistency is entirely changed; it becomes thinner and can not be made brittle even by dropping it into cold water. It is suitable for serving on various kinds of puddings.

Strawberry Sauce.

Strawberry sauce, for puddings or boiled rice, which is usually made by mixing butter, sugar, and mashed berries, is a good means of securing the strawberry flavor at times when berries are too high-priced to be used in large quantities. The substitution of honey for sugar has proved to be practicable. In fact, it obviates one of the chief difficulties in making this sauce—the tendency to curdle.

2 tablespoons butter.
⅔ cup mashed strawberries.
½ cup honey.

Beat together the honey and butter. Add the strawberries slowly, keeping the mixture cool by setting the dish in water. Serve on boiled rice or cottage pudding.

Salad Dressing.

4 egg yolks.
2 tablespoons vinegar or lemon juice.
2 tablespoons butter.
2 tablespoons honey.
1 teaspoon mustard.
1 teaspoon salt.
Paprika to taste.
1 cup cream.

Heat the cream in a double boiler. Beat the eggs, and add to them all the other ingredients but the cream. Pour the cream slowly over the mixture, beating constantly. Pour it into the double boiler and cook until it thickens, or mix all the ingredients but the cream and cook in a double boiler until the mixture thickens. As the dressing is needed combine this mixture with whipped cream. This dressing is particularly suitable for fruit salads.

Nougat.

½ cup honey.
½ cup brown sugar.
1 pound almonds.
2 egg whites.

Boil the honey and sugar together until drops of the mixture hold their shape when poured into cold water. Add the whites of the eggs, well beaten, and cook very slowly, stirring constantly, until the mixture becomes brittle when dropped into water. Add the almonds and cool under a weight. The candy can be broken into pieces, or may be cut and wrapped in waxed paper.

Honey Fudge.

2 cups sugar.
½ cup honey.
½ cup water.
2 egg whites.
1 teaspoon of vanilla extract.

Boil together the sugar, honey, and water until the sirup spins a thread when dropped from a spoon (about 250° F.). Pour the sirup over the well-beaten whites of the eggs, beating continuously and until the mixture crystallizes, adding the flavoring after the mixture has cooled a little. Drop in small pieces on buttered or paraffin paper. The vanilla may be omitted.

Honey Caramels.

2 cups granulated sugar.
½ cup cream or milk.
½ cup honey.
½ cup butter.

Mix the ingredients; heat and stir until the sugar is dissolved; then cook without stirring until a firm ball can be formed from a little of the mixture dropped into cold water. Beat the mixture until it crystallizes, pour into buttered pans, and cut into squares. The addition of pecan nuts improves these caramels.

Honey Popcorn Balls.

Honey can be heated up to about 245° F. without being greatly changed in color or flavor. If it is heated carefully most of the water is expelled. The honey then becomes hard on cooling and can be used for making popcorn balls. To make them, dip the popped corn into the hot honey, shape into balls and cool. Honey popcorn balls absorb moisture on standing in the air. They must therefore be either kept very closely covered or reheated and dried before being used.

○

U. S. DEPARTMENT OF AGRICULTURE
FARMERS' BULLETIN NO. 1054
HONEY AS FOOD IN THE HOME

Reserve

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 653 Rev. Aug. 1922

HONEY AND ITS USES IN THE HOME

HONEY is a sweet, old as the race, and always held in esteem. The flavor and aroma vary with the predominating kind of flower which the bees visit, and one can take advantage of this when selecting honey for the table, either to get a favorite flavor or to get variety by choosing different flavors.

Besides its use for table purposes, honey is much used in cooking to replace all or part of the sugar called for by a recipe. A general rule in such cases is to use a cup of honey in place of a cup of sugar and to cut down the water or other liquid by one-fourth cup for each cup of honey used, to make up for the water in the honey.

The purpose which honey serves in the diet is like that of sugar—it is a source of energy in readily available form, and a flavor food which has many uses by itself and which adds to the palatability of other foods.

Besides discussing the nature and food value of honey, its place in the diet and related questions, this bulletin gives many suggestions and recipes for using honey in the home.

Beekeeping is an industry which is worthy of increased development, since it meets the growing demand for this palatable and wholesome food.

Washington, D. C.

Issued April 7, 1915.
Slightly revised August, 1922.

HONEY AND ITS USES IN THE HOME.

By CAROLINE L. HUNT, *Specialist, Bureau of Home Economics*, and HELEN W. ATWATER, formerly *Specialist, Office of Home Economics*.

CONTENTS.

	Page.		Page.
Ingredients of honey	1	Honey in cookery	8
Food value of honey	2	Bread and muffins	12
Flavor of honey	4	Cakes, cookies, etc	13
Wholesomeness	5	Desserts	18
Economy of honey as food	6	Preserved fruits	19
Uses of honey	7	Icing, sauces, candies, etc	20

INGREDIENTS OF HONEY.

IN THE DAYS before trade with the Tropics introduced cane sugar into temperate regions honey was by far the most common sweet substance available for human food. In very early times men discovered that the material deposited by honeybees in hollow trees and in the crevices of rocks was a valuable and agreeable food and learned to appropriate it to their own use. Such wild honey is still gathered in Palestine and in the less advanced parts of Africa, in Asia, and in South and Central America, that from Peru making an important article of export. Bee trees, which were considered a prize in pioneer times in this country, are still valued in some remote rural regions, and not infrequently people living in country or village take the comb from a colony of bees which has settled in a corner under the weatherboarding of a building or some similar place.

There are two kinds of natural honey, known as floral, or normal, and honeydew, or abnormal, the former being made from nectar, a sweet liquid secreted by flowers, and the latter from honeydew, a sweet substance deposited on the leaves of plants by plant lice and other insects. Unless otherwise stated, the term "honey" when used in this bulletin may be understood to refer to the kind made from nectar, or to that in which the quantity of honeydew is so small that it does not greatly affect the character of the product.

The chief materials that the worker bees bring to the hive are nectar, pollen, and propolis. They collect the pollen on the hairs on their bodies, place it in the so-called pollen baskets on their legs, and thus carry it back to the hive to be deposited near the brood cells. This pollen is rich in nitrogenous material and is important as food for the young and developing bees (larvæ). A few grains usually find their way into the honey cells. Propolis or bee glue is obtained from the gums exuding from trees and shrubs. It is taken to the

hive in the same way as pollen and is used to make the hive waterproof and sometimes to strengthen the edges of the comb. If any gets on the capping of the honey it tends to spoil the appearance of the combs; these tracts of propolis are known as "travel stain."

Nectar is the material from which honey is made. The bees suck it out of the flower with their long tongues and swallow it into the honey sac where it undergoes some changes not yet well understood. It consists chiefly of sugar and water, the former constituting usually between one-fifth and two-fifths of the entire weight and the latter between three-fifths and four-fifths. With this substance are mixed small quantities of other materials, chiefly mineral matters, gums, and volatile bodies. To the latter the aroma and flavor of honey are chiefly due.

The changes by means of which nectar is transformed into the finished honey are technically known as "ripening." They take place partly in the honey sac of the bee, and partly in the cells of the comb, continuing even after the latter have been capped with wax. They consist mainly in removal of part of the water from the nectar, a task which the bees accomplish by warming the air of the hives and also by fanning the nectar in the cells, and in the change in the chemical nature of the sugars, which will be described later (see p. 7).

Wax is made in and secreted from special glands on the abdomen of the worker bee. Several pounds of honey are used in producing a pound of wax, and a high temperature must be kept up in the hive by the bees while it is being made. Because of the cost of wax secretion beekeepers usually try to arrange that the bees shall have little comb building to do except when comb honey is being produced.

FOOD VALUE OF HONEY.

So far as its food value is concerned honey may be roughly described as a sirup with a distinctive flavor and aroma made up of 4 parts sugar to 1 part water. There are several kinds of sugars present in honey, including cane sugar (sucrose), grape sugar (dextrose), and fruit sugar (levulose); the last two together being called invert sugar. Some dextrin is also present as well as a variety of other substances in very small amounts. Included among them are nitrogenous substances (protein), which occur in quantities too minute to affect the food value of honey for man. Some of the other substances present in minute quantity, namely, volatile oils, or other bodies of pronounced odor or flavor from the nectar, are valuable because they influence the flavor and aroma of the honey.

According to data gathered by the Bureau of Chemistry [1] honey, on an average, contains in round numbers per 100 parts 18 parts water, 78 parts carbohydrate (including 76 parts sugar and 2 parts dextrin), 0.2 part mineral substance, or ash, and nearly 4 parts of undetermined substances such as pollen grain, gum, bee glue, formic acid and volatile oils, and other flavor substances. These are average values, and there is, of course, considerable variation in individual honeys. For instance, the proportion of water varies from about one-eighth to one-fourth of the total weight of the honey, being influenced by the moisture in the air at the time the honey is produced

[1] U. S. Dept. Agr., Bur. Chem. Bul. 110.

and the dryness of the atmosphere in which the honey is kept afterwards. Samples of honey from conspicuously dry localities (the southwestern part of the United States, for instance) and honeys made in other localities in very dry weather have a relatively low water content.

Honey contains a small amount of mineral matter, including magnesia, lime, iron, and phosphoric acid. In this respect it resembles maple sirup and unrefined sugar rather than white sugar, from which the mineral substances originally present in the plant juices have been removed in the course of the refining process. These mineral substances do not exceed more than 1 part per 100 of the weight of the honey and for this reason do not contribute greatly to the total mineral matter of the diet even when honey is used freely. They are not, however, to be wholly disregarded, for mineral substances, particularly lime, are likely to run low unless the food materials of the diet are carefully selected. A very little vitamin has been found in honey but not enough to be significant in an ordinary mixed diet.

The percentage of the different sugars varies more or less, but under any circumstance the amount of cane sugar is small (some 2 parts per 100) and less than in the nectar from which the honey is made. The proportion of dextrose (grape sugar) and levulose (fruit sugar) making up the total invert sugar varies in honey as it does in the nectar from which it is made, but this is of no importance in planning meals. However, it is of practical importance for the reason that it determines the character and appearance of the honey. Honey will granulate easily if the proportion of dextrose is large, but this is not the case if levulose predominates. For example, alfalfa honey, which contains a high percentage of dextrose, often forms such a solid mass of crystals that it is sold in cakes. This may be an advantage sometimes. Thus, the solid alfalfa honey can be used for such purposes as filling for layer cakes, for which liquid honey would not be so suitable because it would run out. The proportion of dextrin present in normal or nectar honey is so small that it affects neither food nor cooking values. Abnormal or honeydew honey, however, contains so much dextrin that it requires special handling in cooking. This is a matter of interest to professional bakers rather than to housekeepers, as such honey is not commonly used in the home.

Since the principal ingredient of honey is sugar, it is obvious that it should be classed with the fuel foods which supply the body with the energy it needs for the various tasks it performs rather than those whose function is to build and repair the body—that is, the "tissue formers," as they are sometimes called. If honey contained no water its energy value would be practically the same, pound for pound, as that of cane sugar. However, since about one-fifth of its total weight is water, it follows that its energy value is one-fifth less than that of cane sugar, being 1,485 calories per pound.

In planning meals, particularly in hospitals, children's homes, and other institutions where large quantities are required, it is often convenient to have some quick and fairly accurate method of estimating the relative value of different articles of diet which are used in similar ways. For this reason it is worth remembering that an ordinary tablespoonful of honey weighs a trifle over an ounce and

will furnish the body 100 calories. The same amount of energy would be supplied by five-sixths of an ounce of sugar, by 1¼ ounces of molasses, or by a little less than an ounce of preserves (such as orange marmalade).

FLAVOR OF HONEY.

Besides an intense sweet taste, honey retains enough of the perfume of the flowers from which it comes to have a distinctive flavor which has always set it apart as a food to be prized.

The flavor and aroma of honey depend largely upon the blossoms from which the nectar is obtained. The nectar of each kind of flower contains a distinctive combination of oils and other substances which gives the blossoms their special fragrance, and these substances are retained in the honey made from the nectar. It is practically impossible to prevent bees from visiting more than one kind of flower during a given period, and, strictly speaking, almost every kind of honey is made from a mixture of different nectars. Nevertheless, when the hives are situated near a large supply of one sort of blossom, its nectar usually predominates and its flavor and aroma can be easily recognized in the honey. It is perfectly correct, therefore, to speak of basswood honey, fruit-blossom honey, buckwheat honey, etc.

Different localities naturally produce different kinds of honey, and different kinds may be produced in the same locality at different seasons, according to the kinds of flowers which abound. Several famous European honeys, among them the choice French variety from Narbonne, owe their characteristic aromatic flavor to wild thyme and other flowers of the mint family. In orange honey from districts where orange blossoms abound the peculiar aroma and flavor of the flowers are very clearly marked. Sage and clover honeys are well-known American varieties in which the characteristics of the nectar are easily and pleasantly recognized.

Choosing between honey from different flowers is mainly a matter of taste; and taste in honey, as in many other things, seems to depend more on what one has been accustomed to than on any real superiority. For example, it sometimes happens that a person who has always used buckwheat honey with its full-bodied, rather acid flavor, imagines that a mild, light honey with less of the characteristic "comby" taste must be adulterated, whereas a person who is familiar only with some such delicate honey as white clover or alfalfa may consider buckwheat very inferior, or even fancy that it is not genuine floral honey.

The relative abundance of different flowers and consequently the flavor of the honey vary so greatly in different seasons that beekeepers can not count on a regular yield of uniform honey, so one should not think it strange if the honey of one year is different from that of the year before. To overcome this difficulty many of the best wholesale dealers have recently adopted the practice of mixing several honeys to produce a blend. This process is like that adopted long ago in the case of teas. To blend honeys so that the mixture will be generally acceptable requires a great deal of skill, but when the consumer has found a blend which pleases him he is more likely to be able to get honey of that flavor season after season than if he depends on unmixed honeys.

WHOLESOMENESS.

That honey is a satisfactory and wholesome foodstuff is attested by its general acceptance as such wherever and whenever it can be obtained. Special properties and virtues have even been assigned to it in some cases.

Because the chemical change effected by the bee in the sugars of the nectar is the same as that effected by digestive ferments, and the principal sugars may therefore be considered to have undergone the first step of digestion, honey is often said to contain predigested sugar and to be more wholesome than cane sugar. There is no reason, however, to believe that the healthy human body is not equal to the task of digesting any sugar, so a special claim made for the wholesomeness of honey on this ground seems unimportant. It is generally believed that the energy from sugar is liberated for the use of the body more quickly than that from such other fuel foods as starch and fat. Hence it is said to delay the oncoming of fatigue during great muscular exertion. For this reason some form of sweet is included in almost all army rations and is often used by persons undergoing severe physical exertion, such as mountaineers and athletes. Although no experiments have been made to test the value of honey in this respect, it seems safe to say that it would have the same good effect as other sweets.

Everyone knows that eating too much ordinary sugar upsets digestion. The difficulties in the effects of too much honey and too much cane sugar are rather complicated, but it is safe to say that eating too much of either should be avoided, even by healthy people.

For some persons suffering from serious digestive disturbance honey may be a safer form of sugar than cane sugar, but with other forms of indigestion the opposite is true; it depends upon the particular form of disturbance, and such matters should be decided by a skillful physician for each individual case. For persons of very delicate digestion the particles of wax in comb honey may cause trouble, as it is believed that the digestive processes do not have any effect on them. For normal persons, however, the wax should be as harmless as are the particles of indigestible material contained in many other wholesome foods.

Honey is sometimes said to have a mildly laxative effect, and the statement is doubtless true, as it is of many other food materials, especially those of vegetable origin. If a person had to live on a very limited number of foods, especialy if he had a tendency to constipation, it might be wise to use honey rather generally in preference to other forms of sweet; but the effect of such small amounts of honey as would be used in an ordinary diet would hardly be worth taking into consideration. Bran biscuits made with honey instead of sugar (see p. 12) would owe any advantage they might have over the ordinary bran biscuit to the laxative effect of the honey.

Other medicinal qualities have been claimed for honey, particularly in older writings, and it still finds use in medicinal preparations, but no doubt more because of tradition and of the flavor and texture it imparts than for actual medicinal properties. From the standpoint of the honey industry this is a matter of little importance, for honey is regarded by the vast majority of its users as a food and not as a drug product.

As a matter of fact, honey does not need the specific medicinal properties attributed to it to hold its place as a wholesome, useful foodstuff, well worthy of even more extended use than it already has, not only because it is agreeable and economical in itself, but also because it introduces a pleasing variety and thus makes the diet more appetizing, and consequently more wholesome.

ECONOMY OF HONEY AS FOOD.

In comparing foods for the purpose of determining which is more economical, it is necessary to take into account not only the relative prices per pound but also the amounts and kinds of nourishment they furnish. Honey, which contains little besides sugar, and is therefore useful chiefly as fuel for the body, can not be substituted in the diet for such foods as milk, eggs, and meat, which furnish not only fuel but also material for making body protein. The relative prices of honey and of milk, eggs, or meat, therefore, have little significance. Honey, however, can be used as a substitute for sugar and to a certain extent as a substitute for fat. Its fuel value per pound is about four-fifth that of sugar and nearly one-half that of butter.

Where honey is home-produced or very abundant locally at favorable prices, it can and does replace sugar for many household purposes. However, its distinctive flavor as well as its sweetening power and energy value are factors which should be kept in mind when comparing its relative cost, for in this respect it compares with maple sirup and maple sugar, which have a distinctive flavor, rather than with ordinary sugar.

The differences between the wholesale prices of comb honey and of extracted honey are much greater than those between the retail prices. A pound of extracted honey in a jar usually sells at retail for about the same as the average section of comb honey, which has a net weight of 14 ounces. On the other hand, the wholesale price of comb honey is usually about 50 per cent higher than that of extracted honey. The reason for this is that the producer of comb honey does far more of the work of getting his product ready for the final market than does the producer of extracted honey. As the sections leave his hands so they are passed over the counter to the housewife or other retail purchaser. Extracted honey, on the contrary, is sold by the producer to the bottler, not in pound lots but in 5-gallon cans or barrels. The bottler does the work of blending, liquefying, bottling, labeling, and packing. It is possible, therefore, for the consumer to save money by buying extracted honey at wholesale and avoiding the cost of the various kinds of work which prepare it for the retail market.

Where only small quantities of honey are used, the effort to buy in the cheapest market may cost more in energy than it saves in money. Where, however, large supplies are bought, the purchaser should try to get into direct communication with the producer and take advantage of the parcel post as a means of transportation. The names of dealers in his vicinity can often be obtained from the bee-keepers' magazines, or by writing to the State inspector of apiaries. The names of State inspectors and often those of local dealers can be obtained by addressing the Bureau of Entomology of the United States Department of Agriculture.

Now that extracted honey is usually pure and of good quality, the advantage of comb honey lies chiefly in its attractiveness to the eye. Unless very great care is taken in extracting honey, some of the volatile bodies on which its flavor depends will probably be lost. Hence it often happens that the flavor of comb honey is really slightly superior to the same kind extracted. Many persons think that the presence of the wax gives the honey a more pleasant consistency for table use. Whether these advantages are worth the extra cost each consumer must decide for himself.

Comb honey is commonly graded according to finish and color. It is described as Extra Fancy, Fancy, No. 1, or No. 2, according to the evenness with which the sections are filled, the freedom of the product from propolis or other stains, and the number of unsealed cells. It is graded according to color, as white, light amber, amber, and dark. From the point of view of food value alone, finish and color are not of importance, though dark honeys are usually of stronger flavor.

In order to comply with the Federal Food and Drugs Act, which applies to all goods shipped from one State to another, every section of honey and every package containing extracted honey must be marked with the net weight. In comb honey this is understood to be the weight of the comb and the honey and to exclude the weight of the wooden frame.

In choosing honey too much importance should not be attached to lightness of color, for some of the best varieties are dark; nor should granulation be thought to imply adulteration. The truth is that crystallization is more likely to occur in pure than in impure honeys, and some pure varieties, especially alfalfa honeys, granulate so easily that they are often sold to the consumer in solid form. The crystals can be easily dissolved by heating the honey, which should be done in a double boiler or other kind of water bath. If the temperature does not go beyond 160° Fahrenheit, there is little danger that either color or flavor will be affected.

Unless in a sealed package, honey should be kept in a dry place; otherwise it is likely to absorb moisture and spoil, for when dilute it will ferment or sour readily, as will any other similar sugar sirup. Heat and dryness are usually found together in the household, and ordinarily the safest places for honey are the warmest places; the least desirable is the refrigerator.

USES OF HONEY.

In its natural state honey is often served much as jelly, jams, and conserves are, and because of its delicate flavor and its sweet taste it is especially adapted for this purpose. This is only one of its many uses, however, for it can be combined with many other foods to form attractive dishes in great variety, and for this reason deservedly ranks as a staple food.

Honey is used both in its natural state and as an ingredient of cooked food. In this country it is more commonly used uncooked than cooked, and practically all comb honey is consumed in this way. Honey is much more commonly used in cookery in Europe than in

America, though commercial bakers and confectioners in the United States use much larger quantities than many persons realize.

The simplest way of using honey is to serve it like jam or sirup with bread, breakfast cereals, boiled rice, pancakes, and other mild-flavored foods. As ordinarily used on bread, an ounce of honey "spreads" as many slices as an ounce of jam. When it is to be used in the place of sirup, some people dilute it by mixing it with hot water, which has the effect of making it not only less sweet but also easier to pour.

Honey or a homemade mixture of honey and sugar sirup can be satisfactorily used for sweetening lemonade and other fruit drinks. Sirup of any kind is more convenient for this purpose than undissolved sugar, and when charged water is to be added it has a further advantage since it has less tendency to expel the gas. It is the custom of many housewives to keep a homemade sirup for this purpose, particularly in hot weather, and variety can be secured by occasionally using honey.

Honey can be used in place of sugar for some kinds of preserving, and there is reason to believe that fruits cooked in it keep very well indeed. Bar-le-Duc currants, which form a very delicate and expensive article of commerce, are often made by cooking currants in honey. They are frequently served with cream cheese and crackers or other form of bread. A satisfactory substitute may be secured by serving honey and tart fruit, either cooked or uncooked, with cottage cheese and bread and butter. Three ounces of cottage cheese curd, two ounces of bread, two-thirds ounce of butter (either added to the curd or spread on the bread), two ounces of honey, and six ounces of strawberries or other watery fruit would make a reasonably well-balanced meal. Sometimes honey alone is served with cream cheese. Crisp crackers, spread with cream cheese and honey, form a good combination from the point of view of nutritive value and taste. Honey may be substituted for sugar in baking apples.

HONEY IN COOKERY.

Most housekeepers know that honey can be used in cookery, but not all realize in how many ways it can be served and of how many dishes it may form a part.

As a result of extended studies of honey and its place in the diet, some suggestions made for using honey and recipes are given for a variety of dishes in which it is used.

When used in cookery honey does not always produce the same effect as corresponding quantities of sugar or molasses, and the reason for some of the differences between them are not well understood. Careful experiments with various types of honeys and honey recipes were therefore made as part of the experimental work on foods of the United States Department of Agriculture, in the hope of explaining such points, and all the recipes (pp. 12–21) were tested. Most of the facts stated in the following paragraphs were obtained in this way.

The fact that honey consists principally of sugar and water and is slightly acid suggests that it is a suitable substitute for molasses in cookery. As a matter of fact, it can be used in the place of molasses in all forms of breads, muffins, and cakes, and makes a more

delicate flavored product. It contains less acid than molasses, however, and so requires less soda when it is substituted for molasses in recipes which do not include sour milk or other acid, and the cook must be careful about the amount of soda used. Many trials were made with different kinds of honey in this laboratory which showed that the allowance of soda to a cupful of honey very generally ranges between one-fourth and one-half of a level teaspoonful. Unless the cook is thoroughly familiar with her honey, she would do well to mix and bake a small sample of dough before she decides on the amount of soda to be put into the main portion.

When honey is to be substituted for common sugar it is desirable to know not only how it compares in sweetness, but also how much allowance must be made for the water which it contains. Assuming a cupful of good honey to measure one-half pint, it should weigh about 12 ounces. Of this, 9 to 10 ounces, roughly speaking, is sugar. A cupful of honey, therefore, corresponds to a little more than a cupful of cane sugar. Hence, it is safe to estimate that a cupful of honey will sweeten a dish just about as much as a cupful of sugar. Besides the sugars, there is about one-fifth of a cupful of water in a cupful of honey. Theoretically, therefore, in making cake one should substitute honey for sugar cupful for cupful, and for each cupful of honey use one-fifth cupful less of the milk or other liquid which the recipe calls for. For practical purposes, however, it is accurate enough to consider that the water in a cupful of honey is one-fourth of a cupful. This rule was found to hold good with a large number of ordinary cake recipes which were tested in this laboratory. These facts, if kept in mind, make special honey recipes unnecessary and enable the cook with very slight calculation to modify ordinary ones so that honey can be used in place of sugar. Besides slightly changing the flavor of the cake, honey used in the place of sugar makes it keep moist longer. A honey cake made with butter will keep its quality until the butter grows rancid, and one made without butter will keep fresh for months and even improve in flavor. What is true of the cakes is also true of the dough; it can be kept almost indefinitely. Evidently, then, honey is especially useful in recipes without butter. For this reason, most of the honey cakes experimentally studied in this laboratory were made according to the following formula which is typical of Honig Kuchen, or German Christmas cake: Three-fourths cup honey, one-half cup sugar, two cups or more flour, one-fourth teaspoon powdered ginger, one-half teaspoon powdered cardamom seed, one teaspoon cinnamon, one-eighth teaspoon cloves, a speck white pepper, a pinch salt, one-fourth to one-half teaspoon soda, one tablespoon water, and two ounces blanched almonds cut in small pieces or chopped.

The directions for making the honey cakes, not only in the older cookbooks, but also in many modern bakers' manuals, are extremely elaborate; one of the purposes of the experiments made in this laboratory was to determine how many of the suggested precautions are necessary.

Recipes usually direct that the honey be brought to the boiling point and then skimmed and cooled. This must be done with great care, for the honey is very likely to boil over. Experiments with a large variety of honeys such as are ordinarily purchased in the United States for household use, showed that nothing rises to the top

during the boiling which can not be easily stirred back into the liquid. It seems likely, therefore, that the custom of boiling had its origin at the time when honey, or at least the grades bakers use, was much less carefully prepared than at present and contained impurities of many kinds. A cake made by stirring flour directly into cold honey was found to be in no way inferior to those made with honey which had been heated.

Some recipes found in the older cookbooks, particularly those of foreign origin, direct that the spices be boiled with the honey and give as a reason for this that the heating brings out their flavor and makes them "go further." The weight of this argument is obviously difficult to determine, but the work carried out by the Department of Agriculture gave no evidence that the short heating at the beginning is of special importance in comparison with the long heating which the materials must receive while the cake is being baked.

The older recipes almost invariably direct that the dough be kept for a certain length of time, sometimes one day, sometimes more, before the soda is added. So reliable an authority as König says that this is because, owing to the presence of bacteria, the acidity of the mixtures increases with time, and that, therefore, more soda can be used after the dough has stood. To test this point, dough was mixed in this laboratory and analyzed by the Bureau of Chemistry; it was found to have 0.0775 per cent of acidity immediately after being mixed, and 0.1 per cent after four days' time. Another sample increased in six days from 0.108 per cent to 0.117 per cent, and during the following six days to 0.125 per cent. It seems probable, therefore, that the acid does usually increase; but even so, the question arises whether there is not in the beginning enough acid to act on soda sufficient to raise the cake. In order to determine this, two samples of dough were mixed. To No. 1 the soda was added at once and baking followed immediately. No. 2 was kept for a week, when the soda was added and the cake was baked. The second was neither lighter nor in any way superior to the first.

It is frequently stated that the dough can be more easily kneaded if it is allowed to stand several days. In order to test this point, a dough was mixed which was stiff enough to hold its shape, but which stuck to the hands and the molding board. After a week's time it could be molded freely on an unfloured board without sticking to it. This argument for keeping the dough seems, therefore, to be sound.

It is sometimes said that the reason why cakes made with honey keep soft for a long time is that they absorb moisture from the air. To test this point a cake made according to the recipe already given was weighed at different intervals during 7½ months. The weight of the dough was 526 grams, the weight of the cake on the day of baking, April 17, 1913, was 499 grams after it had been removed from the pan, and at the final weighing on December 2 of the same year, it weighed 469.7 grams. The loss of weight was continuous during all this time, with the exception that in the late summer there was a slight increase in the weight, probably due to unusual dampness of the air; this was followed by a relatively great loss. On December 2, when the cake was cut, it was in good condition, and had a fine flavor and the consistency of a soft cooky. The experiment was repeated with small honey cakes, and these also

showed no increase in weight before softening. While these experiments are not sufficient for definite conclusions, they indicate that the increased softness of the honey cake is not due to the absorption of water.

Icing made with honey or with part honey and part sugar according to the recipe on page 20 has the same advantage that honey cakes have. Such icing made in this laboratory was found at the end of 10 months to be soft and in as good condition as when originally made. It would, therefore, seem to be suitable for cakes that are to be kept for a long time.

In most of the recipes in foreign cookbooks "potash" (potassium bicarbonate) is recommended for use with honey to raise the dough. This is very similar in its properties to ordinary baking soda (sodium bicarbonate) and seems to have no advantage over it for this purpose. Whatever may have been the conditions in earlier times in Europe, baking soda is a common kitchen commodity in most American homes, and the potassium bicarbonate is almost unknown for household purposes. Both the potassium bicarbonate and baking soda gave much better results in the honey receipts tested than did the baking powder, and naturally, since the acid honey calls for an alkali like soda rather than a mixture of acid and alkali such as baking powder. If baking powder were used it should be in addition to soda enough to neutralize the acid of the honey, not merely as a substitute for soda, just as housekeepers sometimes neutralize sour milk or molasses with soda and then add baking powder to raise the dough.

In the countries where honey cakes have come to perfection spices are used which are somewhat uncommon in this country, and it is reasonable to suppose that long experience has taught a good combination of flavors. Cardamom seed, a rather old-fashioned flavor which is still sometimes found in candies, seems to combine more satisfactorily with the flavor of honey than some of the spices which are better known in our kitchens. It is best, however, to use it in combination with other flavoring materials. The following has been found to be a good combination:

Salt, 1 part by measure.
White pepper, 1 part.
Nutmeg, 2 parts.
Cloves, 2 parts.
Ginger, 4 parts.
Cardamom, 8 parts.
Cinnamon, 16 parts.

These should be thoroughly mixed and can be made up in quantity and kept ready for use.

Aniseed and coriander seed are also often used in honey cakes in combination with other spices. The following mixture is recommended in a baker's handbook,[2] the amounts given being suitable for 10 pounds of dough:

2 ounces ground cinnamon.
¼ ounce ground cloves.
2 ounces aniseed.
1 ounce finely-ground coriander seed.

In considering the uses of honey in cookery, it is well to remember that it owes its flavor to bodies which are very volatile and that for this reason it should not be heated unnecessarily hot or unnecessarily long.

[2] The Twentieth Century Book for the Progressive Baker. By F. L. Gienandt. Boston, 1913, p. 129.

In order to learn how honey is used in cookery, standard cookbooks from many countries were examined and many persons familiar with honey cookery were consulted. Innumerable as the recipes were, it was soon found that they belonged mainly to only a few different types, such as breads made with honey, honey cakes made with or without butter, fruits preserved in honey, and sauces and candies made with honey. Many recipes were tested in this laboratory, and some of the more desirable ones were adapted for use in the United States and are published here.

BREAD AND MUFFINS.

Honey is not often used in bread making, but there is no reason why it may not be used in yeast bread as food for the yeast plant or be substituted for molasses or sugar in varieties of bread which call for such sweetening. A few recipes are here given.

Bran Brown Bread.

1 cup white or whole wheat flour.
1 teaspoon soda.
¼ teaspoon salt.
1 cup bran.
½ cup honey.
1 cup sour milk.
½ cup raisins floured.

Sift together the flour, soda, and salt, and add the other ingredients. Steam three hours or bake 40 minutes in a slow oven. If the amount of milk is increased by half, the bread is more delicate and has a somewhat higher food value.

Steamed Brown Bread.

1 cup yellow corn meal.
2 cups graham flour.
⅔ cup honey.
2 cups sour milk.
1 teaspoon salt.
1½ teaspoons soda.
1 tablespoon boiling water.
1 cup raisins.

Mix together the meal, flour, and salt; add the sour milk and the honey and then the soda dissolved in the boiling water; and the raisins. Steam three hours in covered receptacles, which should be not more than two-thirds full at the beginning of the cooking.

Honey Bread.

2 cups honey.
4 cups rye flour.
1 teaspoon soda.
4 teaspoons aniseed.
2 teaspoons ginger.
4 teaspoons powdered cardamom seed.
2 egg yolks.
¼ cup brown sugar.

Sift the flour with the spices and soda and add the other ingredients. Put the dough into shallow buttered pans to the depth of about an inch and bake in a hot oven.

Honey and Nut Bran Muffins.

½ cup honey.
1 cup flour.
¼ to ½ teaspoon soda.
¼ teaspoon salt.
2 cups bran.
1 tablespoon melted butter.
1½ cups milk.
¾ cup finely chopped English walnuts.

Sift together the flour, soda, and salt, and mix them with the bran. Add the other ingredients and bake for 25 or 30 minutes in a hot oven in gem tins. This will make about 16 large muffins, each of which may be considered roughly to be a 100-calorie portion and to contain 2 grams of protein.

Honey and Nut Sandwiches.

Mix chopped pecan meats, almonds, or other nuts with just enough honey to act as a binder, and use as filling for sandwiches.

Honey and Cream Cheese Sandwiches.

Mix honey with cream cheese and use as filling for bread or baking-powder biscuit sandwiches. Chopped nut may be added to the honey and cheese if desired.

CAKES, COOKIES, ETC.

By far the most general use of honey in cookery is for cakes. Of these there is an almost endless variety, from rich fruit cake in loaves or elaborate pastries with honey filling to simple cookies. As has been pointed out, the honey flavor combines especially well with spices. The presence of honey also makes the cakes keep fresh longer. These two facts probably explain why honey cakes are so largely produced by commercial bakers. Housekeepers should remember that most honey cakes and cookies are not ready to use until about a month after they are made.

Hard Honey Cake.

¾ cup honey.
½ cup sugar.
2½ cups flour.
1 egg.
¼ teaspoon ginger.
1 teaspoon cinnamon.
½ teaspoon ground cardamom seed.
½ teaspoon cloves.
Speck white pepper.
Speck salt.
½ teaspoon soda.
1 tablespoon water.
2 ounces blanched almonds cut into small pieces or chopped.

Sift together the flour and spices, dissolve the soda in the water, beat the egg and combine all the ingredients. Beat or knead the mixture thoroughly. Cook a small sample. If it does not rise sufficiently, add a little more soda and honey; if it falls, add a little more flour. Roll out the dough to the thickness of about three-fourths of an inch and bake in a hot oven. When the cake is done glaze it with a thick sirup of sugar and water and allow it to dry in a slow oven or in some other warm place. While it is still warm, cut it into long strips. Or it may be left in one large cake, to be cut into very thin slices when served. This cake will become very hard on cooling and will not be soft enough to eat for several weeks, but will keep in good condition for an indefinite length of time.

Butter Honey Cake.

1½ cups honey.
½ cup butter.
3 egg yolks.
5 cups flour.
2 teaspoons ground cinnamon.
½ teaspoon salt.
1½ teaspoons soda.
2 tablespoons orange-flower water (water may be substituted).
Whites 3 eggs.

Rub together the honey and butter; add the unbeaten yolks and beat thoroughly. Add the flour sifted with the cinnamon and the salt; and the soda dissolved in the orange-flower water. Beat the mixture thoroughly and add the well-beaten whites of the eggs. Bake in shallow tins and cover with frosting made as follows:

Orange Frosting for Butter Honey Cake.

Grated rind 1 orange.
1 teaspoon lemon juice.
1 tablespoon orange juice.
1 egg yolk.
Confectioners' sugar.

Mix all ingredients but the sugar and allow the mixture to stand for an hour. Strain and add confectioners' sugar until the frosting is sufficiently thick to be spread on the cake.

For the cinnamon in the Butter Honey Cake the following mixture of spices may be substituted:

½ teaspoon ginger.
2 teaspoons cinnamon.
1 teaspoon ground cardamom seed.
1 teaspoon cloves.
¼ teaspoon nutmeg.
¼ teaspoon white pepper.

Chopped citron or nuts may also be added.

This mixture may also be flavored with ginger, aniseed, or cardamom seed.

Butter Honey Cake No. 2.

1 cup honey.
½ cup butter.
½ teaspoon ginger.
½ teaspoon cinnamon.
1 teaspoon ground cardamom seed.
3 eggs.
3 cups flour.
½ to 1 teaspoon soda.
1 ounce candied orange peel.
1 ounce candied lemon peel, or
1 cup seeded raisins.

Mix the honey and butter by warming slightly and stirring; add the spices and the yolks of the eggs unbeaten and beat the mixture thoroughly. Add the flour and the soda dissolved in a little water, then the whites of the eggs beaten stiff, and finally the fruit. Bake in a moderate oven.

Nut Honey Cake.

2 cups brown sugar.
2 cups honey.
6 egg yolks.
3 cups flour.
Speck of salt.
1½ teaspoons soda.
3 teaspoons ground cinnamon.
½ teaspoon ground cloves.
½ teaspoon ground nutmeg.
½ teaspoon allspice.
1 cup chopped raisins.
½ ounce citron cut in small pieces.
½ ounce candied orange peel cut in small pieces.
½ pound almonds coarsely chopped.
Whites of 3 eggs.

Mix the sugar, honey, and the yolks of the eggs, and beat thoroughly. Sift together the flour, salt, spices, and soda. Combine all ingredients but the whites of the eggs. Beat the whites of the eggs till they are stiff and add them last. Pour the dough to the depth of about half an inch into well-buttered tins, and bake in a slow oven for one-half hour.

Frosting for Nut Honey Cake.

1½ cups sugar.
3 egg whites.
¾ cup water.

Boil the sugar and water until the sirup forms a thread when dropped from the spoon. While still hot, pour the sirup over the well-beaten whites of the eggs, beating the mixture until it is of the right consistency to spread.

Chocolate Nut Honey Cake.

To the above cake add 3 ounces of chocolate grated.

Soft Honey Cake.

½ cup butter.
1 cup honey.
1 egg.
½ cup sour milk.
1 teaspoon soda.
½ teaspoon cinnamon.
½ teaspoon ginger.
4 cups flour.

Rub the butter and honey together; add the egg well beaten, then the sour milk and the flour sifted with the soda and spices. Bake in a shallow pan.

Honey Sponge Cake.

½ cup sugar.
½ cup honey.
4 eggs.
1 cup sifted flour.

Mix the sugar and honey and boil until the sirup will spin a thread when dropped from the spoon. Pour the sirup over the yokes of the eggs which have

been beaten until light. Beat this mixture until cold; then add the flour, and cut and fold the beaten whites of the eggs into the mixture. Bake for 40 or 50 minutes in a pan lined with buttered paper, in a slow oven.

This cake can be made with a cupful of unheated honey in place of the honey and sugar sirup, but the quality is not quite so good.

Honey Pound Cake.

A good pound cake can be made by using equal weights of honey, sugar, eggs, flour, and butter. A little soda should be added because of the acidity of the honey, and a good flavoring is cardamom seed and orange-flower water. Or a cake similar to pound cake may be made as follows:

1 cup sugar.
¾ cup honey.
1 cup butter.
4 eggs.
2 cups pastry flour.
½ teaspoon powdered cardamom seed.
½ teaspoon soda.
½ teaspoon orange-flower water.

Rub together the butter and sugar, and add the honey. Add the yolks of the eggs well beaten. Finally, add the whites of the eggs, beaten to a stiff froth, and the orange-flower water. Add gradually the flour sifted with the soda and cardamom seed. Beat the mixture for 10 minutes. Put the dough into a warm tin with high sides, and bake in a slow oven one hour.

Ribbon Cake.

UTILIZING CANDIED HONEY AS FILLING.

½ cup butter.
2 cups sugar.
4 eggs.
1 cup milk.
3½ cups flour.
5 teaspoons baking powder.
1½ teaspoons ground cardamom seed.
1½ teaspoons ginger.
¾ teaspoon cinnamon.
¼ teaspoon cloves.
⅓ cup raisins, seeded and cut in pieces.
⅓ cup figs, finely chopped.
1 tablespoon honey.

Rub the butter and sugar together and add the yolks of the eggs. Sift together the flour and baking powder and add them to the mixture, alternating them with the milk. Finally, add the whites of the eggs well beaten. Bake two-thirds of the mixture in two layer-cake pans. To the remainder add spices, fruit, and honey, and bake in a layer-cake pan. Put layers together with crystallized honey.

Honey Fruit Cake.

3 cups flour.
2 teaspoons soda.
3½ cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed.
½ teaspoon cloves.
3 pounds raisins (seeded).
1½ pounds currants.
1 pound citron.
1 pound candied cherries.
1 pound candied apricots.
1 pound candied pineapple.
½ cup sour jelly, or
½ cup white grape juice.
2 teaspoons vanilla.
2 ounces candied orange peel.
2 ounces candied lemon peel.

Cut the candied fruit into small pieces, with the exception of the cherries, which should be left whole. Place the fruit in a large dish and sift over it one-half of the flour, mixing thoroughly. Sift the soda with the remainder of the flour. Bring the honey and the butter to boiling point and while still hot add the spices. When the mixture is cool, add the well-beaten yolks of the eggs, then the flour and grape juice or jelly and the well-beaten whites. Finally, add the fruit. The cake should be divided into three or four parts and put into buttered dishes covered with buttered paper tied closely over the tops. Steam for five hours, remove the paper, and bake in a very slow oven for an hour. This makes a very rich cake consisting chiefly of fruit. For the sake of economy, the flour can be increased to even twice the quantity without affecting the quality very much.

Honey Fruit Cake No. 2.

4 cups flour.
3 teaspoons soda.
2 cups honey.
1 cup butter.
6 eggs.
2 teaspoons cinnamon.
2 teaspoons ginger.
3 teaspoons ground cardamom seed.
½ teaspoon cloves.
3 pounds raisins (seeded).
4 ounces citron.
1 pound cranberries.
1 pound canned pineapple.
1 pound dried apricots.
1 pound dried apples.

To prepare the cranberries, pineapples, apricots, and apples, cook each in honey till it is soft; remove from the honey and dry in a very slow oven. A little water should be added to the honey in which the cranberries are cooked, a good proportion of ingredients being equal weights of cranberries, water, and honey. To any honey left over from cooking the fruits add enough honey to make up the total amount called for by the recipe. Mix and cook the cake in the same manner as honey fruit cake No. 1.

Honey Drop Cakes.

½ cup honey.
¼ cup butter.
½ teaspoon cinnamon.
½ teaspoon cloves.
1 egg.
1½ to 2 cups flour.
½ teaspoon soda.
2 tablespoons water.
1 cup raisins, cut into small pieces.

Heat the honey and butter until the butter melts. While the mixture is warm add the spices. When it is cold add part of the flour, the egg well beaten, the soda dissolved in the water, and the raisins. Add enough more flour to make a dough that will hold its shape. Drop by spoonfuls on a buttered tin and bake in a moderate oven.

Yellow Honey Cake.

½ cup sugar.
2 egg yolks.
⅔ cup honey.
½ teaspoon cinnamon.
½ teaspoon cloves.
1½ cups flour.

Sift together the flour and the spices. Mix the sugar and egg yolks, add the honey, and then the flour gradually. Roll out thin, moisten the surface with egg white, and mark into small squares. Bake in a moderate oven.

Honey Cookies No. 1.

½ cup honey.
½ cup sugar.
2½ cups flour.
½ teaspoon soda.
1½ teaspoons cinnamon.
1 teaspoon cloves.
1 teaspoon allspice.
2 ounces finely chopped candied orange peel.
½ pound walnut meats finely chopped.

Sift together the flour, spices, and soda, and add the other ingredients. Knead thoroughly, roll out thin, and cut with a biscuit cutter. These cookies are very hard.

Honey Cookies No. 2.

½ cup honey.
⅓ cup sugar.
½ cup milk.
3 tablespoons lard.
2 egg yolks.
4 cups flour.
½ teaspoon salt.
1 teaspoon ground cinnamon.
½ cup finely chopped almonds.
½ teaspoon soda or 2 teaspoons baking powder.

Bring the first four ingredients to the boiling point and allow the mixture to cool. Sift together the flour, cinnamon, and soda or baking powder. Combine all the ingredients. Roll the mixture out thin on a floured board. Cut out and bake in a moderate oven on tins which have been greased and floured. To prepare the tins properly, brush them over with melted butter and sifted flour, turn them over, and shake off as much as possible of the flour.

Honey Cookies No. 3.

- ½ cup water.
- 1 pound brown sugar or 2 cups packed solidly.
- ½ cup lard.
- 1 cup honey.
- ⅓ cup egg yolks.
- 1 teaspoon soda.
- 6 cups flour.
- 1 teaspoon powdered cardamom seed.
- 1 teaspoon cinnamon.

Heat the water, sugar, lard, and honey until the lard is melted. When cool, add the yolks of the eggs and the flour, sifted with the soda, and spices. Roll out on a floured board and cut into any desired shape. Place a small piece of citron in the middle of each cooky.

Honey Bran Cookies No. 1.

- 2 tablespoons butter.
- ½ cup honey.
- 2 eggs.
- ½ to ½ teaspoon soda.
- ½ cup flour.
- 1 cup bran.
- ½ teaspoon powdered aniseed.

Rub together the butter and honey; add the eggs unbeaten and beat the mixture thoroughly. Sift together the flour, soda, and aniseed. Combine all the ingredients; drop from a teaspoon on to a buttered tin and bake in a moderate oven.

Honey Bran Cookies No. 2.

- 3 cups bran.
- ½ cup sugar.
- ½ to ½ teaspoon soda.
- ½ teaspoon cinnamon.
- ½ teaspoon ginger.
- ½ cup honey.
- ½ cup milk.
- ½ cup melted butter.

Mix the sugar, cinnamon, ginger, and soda with the bran and add the other ingredients. Drop from a spoon upon a buttered pan and bake about 15 minutes.

Rolled Honey Wafers No. 1.

- ¼ cup butter.
- ½ cup honey.
- ⅞ cup flour.
- ½ teaspoon powdered cardamom or aniseed.

Mix together the butter and honey and add the flour, sifted with the spice. Spread out very thin with a broad long-bladed knife or spatula on a buttered, inverted dripping pan, or on flat tins made for the purpose. Mark off in 3-inch squares and bake in a slow oven until delicately browned. While warm, roll into tubular shape and hold until they cool and, if necessary, until they harden into shape. Honey wafers are not quite so tender as those made with sugar.

Rolled Honey Wafers No. 2.

- ½ cup honey.
- ½ cup sugar.
- ½ cup butter.
- ½ cup flour.
- ½ cup milk.
- ½ teaspoon cardamom or aniseed.

Cream the butter; add the sugar, honey, and flour in the order named, and the milk very gradually. Cook as rolled honey wafers No. 1.

Nougat Wafers.

- ½ cup butter.
- 1 cup brown sugar.
- ½ cup milk.
- ½ cup bread flour.
- 4 teaspoons ginger, or
- 2 teaspoons powdered cardamom or aniseed.

Rub together the butter and the sugar and add alternately the milk and the flour sifted with the spices. Spread in a very thin layer on the bottom of an inverted dripping pan or on flat tins made for the purpose. Mark off into pieces about an inch wide and 4 inches long and put together in pairs with honey nougat filling made as follows:

HONEY FILLING FOR NOUGAT WAFERS.

1 cup sugar.
½ cup honey.
¼ cup water.
2 egg whites.

Boil the sugar, water, and honey together until the sirup makes a thread when dropped from a spoon, or until drops of it hold their shape when poured into cold water. Beat the eggs to a stiff froth, pour the sirup over them, put the dish holding the mixture in a place where it will keep warm but not cook rapidly, beat until it will hold its shape.

HONEY RISSOLES.

PASTRY COVERING FOR RISSOLES.

½ cup lard.
2 egg yolks.
1 egg white.
⅔ cup water.
¼ cup brown sugar.
Flour.

Mix together all the ingredients but the flour and add enough of that to make a stiff dough. Roll out as thin as a knife blade, cut into round or square pieces, taking care to avoid the necessity of rolling out the second time, as this is likely to make the dough very tough. A honey filling is used with this dough and is made as follows:

HONEY FILLING FOR RISSOLES.

1 cup honey.
2 ounces candied orange peel.
Rye bread crumbs.
Aniseed.

Bring the honey to the boiling point, remove from the stove, and add as much bread crumbs as it will moisten while it is hot. Add the orange peel and enough powdered aniseed to give a decided flavor. Roll this filling into small balls and lay one in the center of each piece of pastry; fold the pastry over and press the edges together. Bake in a hot oven.

DESSERTS.

The following recipes suggest ways in which honey can be substituted for sugar or molasses in many common desserts. The ingenious cook with honey to spare can easily work out others if she remembers what was said on pages 11 and 12 about the sweetening power and water and acid content of honey:

BAKED HONEY CUSTARD.

5 eggs.
½ cup honey.
4 cups scalded milk.
½ teaspoon powdered cinnamon.
¼ teaspoon salt.

Beat the eggs sufficiently to unite the yolks and whites, but not enough to make them foamy. Add the other ingredients and bake in cups or in a large pan in a moderate oven. The baking dishes should be set in water.

BOILED HONEY CUSTARD.

2 cups milk.
3 egg yolks.
¼ cup honey.
½ teaspoon salt.

Mix the honey, eggs, and salt. Scald the milk and pour it over the eggs. Cook in a double boiler until the mixture thickens. This custard is suitable for use in place of cream on gelatin desserts, or to be poured over sliced oranges or stewed fruit.

Honey Pudding.

½ cup honey.
6 ounces bread crumbs.
½ cup milk.
Rind of half a lemon.
½ teaspoon ginger.
2 egg yolks.
2 tablespoons butter.
2 egg whites.

Mix the honey and the bread crumbs and add the milk, seasonings, and yolks of the eggs. Beat the mixture thoroughly and then add the butter and the whites of the eggs well beaten. Steam for about two hours in a pudding mold which is not more than three-quarters full.

Honey Charlotte Russe.

1 quart cream.
6 lady fingers.
½ cup delicately flavored honey.

Chill the honey by placing the dish containing it in a pan of ice water. Whip the cream and add it to the honey, mixing the two well. Line a dish with lady fingers and fill it with the honey and cream. Serve very cold.

Honey Mousse.

4 eggs.
1 pint cream.
1 cup hot, delicately flavored honey.

Beat the eggs slightly and slowly pour over them the hot honey. Cook until the mixture thickens. When it is cool, add the cream whipped. Put the mixture into a mold, pack in salt and ice, and let it stand three or four hours.

Honey Ice Cream No. 1.

1 quart thin cream.
¾ cup delicately flavored honey.

Mix ingredients and freeze.

Honey Ice Cream No. 2.

1 pint milk.
Yolks 6 eggs.
1 cup honey.
1 pint cream.

Heat the milk in a double boiler. Beat together the honey and eggs add the hot milk, return the mixture to the double boiler, and cook it until it thickens. Add the cream and when the mixture is cool, freeze it.

PRESERVED FRUITS.

Currants.

Bar-le-Duc currants, an article of commerce often made with honey, sell for a relatively high price, in part no doubt because of the large amount of labor involved in preparing them. The seeds are removed from the currants by a method which mutilates the fruit very slightly; the fruit is then preserved in honey or sugar sirup. Those who wish to take the time to preserve currants in this way will find that a convenient way to remove the seeds is to cut a small slit in the side of each currant and remove the seeds by means of a needle. After this is done, weigh the currants and take an equal weight of honey. Bring the honey to the boiling point, add the currants, and allow them to cook at the boiling point for two or three minutes, or until the skins are tender, being careful not to let the mixture boil violently because this is likely to destroy the shape of the fruit. If the currants are so juicy as to liquefy the honey too much, they may be removed and the sirup reduced to the desired consistency, after which the currants may be replaced.

It is possible, of course, to preserve currants in honey according to the same recipe without the removal of the seeds, but the preserve thus obtained is not nearly so delicate as when the seeds are removed.

Cranberries.

A very good preserve may be made from cranberries and honey which will remain in good condition for a long time. Take equal weights of cranberries, honey, and water. Cook the berries in the honey and water until the skins are soft. Remove the berries and boil down the sirup until just enough remains to cover the berries. Pour into glasses and cover as you would jelly. The appearance of the cranberries is improved if each one is pricked several times before cooking and if the cooking is slow at first. This gives the sirup an opportunity to penetrate the berries without destroying their form. A satisfactory method is to place all the ingredients in a double boiler and heat them very slowly. If this method is followed, the boiling down of the sirup is even more necessary than when the berries are cooked more rapidly.

Strawberries.

Take equal weights of strawberries and honey; mix the two and dry in the sun, or preferably in a warm oven; put into carefully sterilized glasses and cover with paraffin.

Apples.

2 quarts apples cut into small pieces.
2 cups honey.
1 cup vinegar.
1 teaspoon cinnamon.

Heat the honey, vinegar, and cinnamon together and cook the apples, a few at a time, in the sirup until they become transparent. Pour the sirup which remains after all the fruits is cooked over the apples.

Fruit and Honey Jelly.

A good jelly may be made from winter apples and honey, using a cupful of honey to each cupful of apple juice and proceeding as in ordinary jelly-making. Honey could probably be used with other fruits suitable for jelly, but no definite directions have been worked out in this laboratory. The more delicately flavored honeys are probably the best for this purpose, alfalfa giving an especially spicy taste.

Icing, Sauces, Candies, Etc.

Honey Icing.

1 cup granulated sugar.
¼ cup water.
¼ cup honey.
1 egg white.

Boil together the sugar and the water for a few moments and then add the honey, taking precautions to prevent the mixture from boiling over, as it is likely to do. Cook until drops of the sirup keep their form when poured into cold water, or to about 250° F. Beat the white of the eggs until stiff, and when the sirup has cooled slightly pour over the egg, beating the mixture continuously until it will hold its shape. This frosting is suitable for use between layers of cake, but is rather too soft for the top. It remains in good condition and soft enough to be spread for many weeks and, therefore, can be made in large quantities for use as needed. After eight months, such icing made in this laboratory was found to be in good condition and soft enough to cut.

Sauce for Ice Cream.

2 tablespoons butter.
2 teaspoons cornstarch.
½ cup honey.

Cook together the cornstarch and butter thoroughly, being careful not to brown them. Add the honey and cook the mixture until it becomes hard when dropped into cold water and until all taste of raw cornstarch has been removed.

Pudding Sauce.

If a small quantity of water be added to the above sauce, its consistency is entirely changed; it becomes thinner and can not be made brittle even by dropping it into cold water. It is suitable for serving on various kinds of puddings.

Strawberry Sauce.

Strawberry sauce, for puddings or boiled rice, which is usually made by mixing butter, sugar, and mashed berries, is a good means of securing the strawberry flavor at times when berries are too high-priced to be used in large quantities. The substitution of honey for sugar has proved to be practicable. In fact, it obviates one of the chief difficulties in making this sauce—the tendency to curdle.

2 tablespoons butter.
⅔ cup mashed strawberries.
½ cup honey.

Beat together the honey and butter. Add the strawberries slowly, keeping the mixture cool by setting the dish in water. Serve on boiled rice or cottage pudding.

Nougat.

⅔ cup honey.
½ cup brown sugar.
1 pound almonds.
2 egg whites.

Boil the honey and sugar together until drops of the mixture hold their shape when poured into cold water. Add the whites of the eggs, well beaten, and cook very slowly, stirring constantly, until the mixture becomes brittle when dropped into water. Add the almonds and cool under a weight. The candy can be broken into pieces or may be cut and wrapped in waxed paper.

Honey Fudge.

2 cups sugar.
½ cup honey.
⅓ cup water.
2 egg whites.
1 teaspoon of vanilla extract.

Boil together the sugar, honey, and water until the sirup spins a thread when dropped from a spoon (about 250° F.). Pour the sirup over the well-beaten whites of the eggs, beating continuously and until the mixture crystallizes, adding the flavoring after the mixture has cooled a little. Drop in small pieces on buttered or paraffin paper. The vanilla may be omitted.

Honey Caramels.

2 cups granulated sugar.
½ cup cream or milk.
½ cup honey.
¼ cup butter.

Mix the ingredients; heat and stir until the sugar is dissolved; then cook without stirring until a firm ball can be formed from a little of the mixture dropped into cold water. Beat the mixture until it crystallizes, pour into buttered pans, and cut into squares. The addition of pecan nuts improves these caramels.

Honey Popcorn Balls.

Honey can be heated up to about 245° F. without being greatly changed in color or flavor. If it is heated carefully most of the water is expelled. The honey then becomes hard on cooling and can be used for making popcorn balls. To make them, dip the popped corn into the hot honey, shape into balls and cool. Honey popcorn balls absorb moisture on standing in the air. They must therefore be either kept very closely covered or reheated and dried before being used.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

February 26, 1926

Secretary of Agriculture	W. M. JARDINE.
Assistant Secretary	R. W. DUNLAP.
Director of Scientific Work	
Director of Regulatory Work	WALTER G. CAMPBELL.
Director of Extension Work	C. W. WARBURTON.
Director of Information	NELSON ANTRIM CRAWFORD.
Director of Personnel and Business Administration	W. W. STOCKBERGER.
Solicitor	R. W. WILLIAMS.
Weather Bureau	CHARLES F. MARVIN, *Chief.*
Bureau of Agricultural Economics	THOMAS P. COOPER, *Chief.*
Bureau of Animal Industry	JOHN R. MOHLER, *Chief.*
Bureau of Plant Industry	WILLIAM A. TAYLOR, *Chief.*
Forest Service	W. B. GREELEY, *Chief.*
Bureau of Chemistry	C. A. BROWNE, *Chief.*
Bureau of Soils	MILTON WHITNEY, *Chief.*
Bureau of Entomology	L. O. HOWARD, *Chief.*
Bureau of Biological Survey	E. W. NELSON, *Chief.*
Bureau of Public Roads	THOMAS H. MACDONALD, *Chief.*
Bureau of Home Economics	LOUISE STANLEY, *Chief.*
Bureau of Dairying	C. W. LARSON, *Chief.*
Fixed Nitrogen Research Laboratory	F. G. COTTRELL, *Director.*
Office of Experiment Stations	E. W. ALLEN, *Chief.*
Office of Cooperative Extension Work	C. B. SMITH, *Chief.*
Library	CLARIBEL R. BARNETT, *Librarian.*
Federal Horticultural Board	C. L. MARLATT, *Chairman.*
Insecticide and Fungicide Board	J. K. HAYWOOD, *Chairman.*
Packers and Stockyards Administration	JOHN T. CAINE, *in Charge.*
Grain Futures Administration	J. W. T. DUVEL, *in Charge.*

This bulletin is a contribution from

Bureau of Home Economics	LOUISE STANLEY, *Chief.*

22

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1926

Rotu... ...rage Crop Investigation files.

UNITED STATES DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN

Rev.ed. follows

WASHINGTON, D. C. 654 APRIL 3, 1915.

Contribution from the Office of Markets and Rural Organization, Charles J. Brand, Chief.

HOW FARMERS MAY IMPROVE THEIR PERSONAL CREDIT.

By C. W. THOMPSON, *Specialist in Rural Organization Work.*

INTRODUCTION.

In this bulletin two general methods whereby farmers may improve their personal credit will be considered: That of temporary agreements with existing loan agencies, agreements terminating with the payment of the loans, and that of permanent articles of agreement among the farmers themselves, or "cooperative credit associations."

TEMPORARY AGREEMENTS WITH EXISTING LOAN AGENCIES.

Three different plans are here presented by which farmers have improved their personal credit with local banks. Each plan has enabled farmers to borrow money at reduced rates of interest and on more favorable terms of repayment than usual. The loans secured under these plans were all used for the purchase of improved dairy stock. However, it is believed that similar arrangements would help farmers to improve their credit in connection with other farm enterprises, such as cattle breeding, and hog raising, or in securing suitable farm equipment.

PLAN I.

Under Plan I, farmers enter into an agreement with local bankers or with other persons who supply the loans to adopt a uniform and approved system of dairy improvement. The security given by the farmers is not different from that ordinarily required. Those furnishing the funds also buy the dairy stock, usually under the advice

NOTE.—This bulletin is intended to give to farmers some practical methods for improving their personal credit through cooperation. It should be of interest to farmers generally, and particularly to those of the South and of the West.

81066°—Bull. 654—15

of dairy specialists connected with the State or Federal Government. The stock is sold to the farmers at actual cost plus a certain percentage (say, 2 per cent) to cover incidental expenses. The lender takes in payment the farmer's personal note with or without indorsement, or with mortgage security on the stock purchased.

Under this plan, as worked out in certain localities in North Dakota, the farmer has borrowed money on his personal note with interest at 8 per cent, whereas the usual local rate is 10 or 12 per cent. The notes were drawn for periods varying from six months to a year, but permitted renewals and partial prepayments on the principal. A modified sample of the memorandum drawn up between the bankers and farmers is given below.

SAMPLE OF MEMORANDUM USED.

THIS MEMORANDUM, made this ..... (Date.) day of ....., (Month.) 19... (Year.)

WITNESSETH that whereas ..... (Name of lender.) proposes to furnish cows and heifers of ..... (Name of breed.) breed and ..... (Name of breed.) bulls, purchasing the same at such points in ..... (Locality.) as may be deemed most advantageous, selling them to the undersigned at the actual cost thereof laid down at the stations of ....., (Names of stations.) plus ..% to be added to such cost to cover incidental expenses incurred in connection with the proposition; and

WHEREAS said ..... (Name of lender.) has agreed to accept in payment for such cattle individual notes from the undersigned purchasers thereof to the amount of such purchase on the basis above named, such notes to be made payable on ..... (Date.) and to bear interest from date of the purchase of such cattle at the rate of ..% per annum and to be made payable to said ....., (Lender.) or such payee as he may name, said ..... (Lender.) agreeing that upon the prompt payment at the maturity of said notes of the interest due and one-half of the principal of such notes, the balance is to be renewed for six months at the said rate of ..% per annum; and, further, that upon the prompt payment of the interest due at the maturity of such renewal the principal of such notes will be renewed for the further term of six months, with interest at the rate of ..% per annum; and

WHEREAS in the shipping of such cattle there may be possible loss on account of injury, or otherwise, it is agreed that any such losses shall be added to the cost of such cattle, the amount thereof being spread over the entire purchase, so that each purchaser shall bear his proportionate share thereof, and

WHEREAS it is proposed that in the distribution of such cattle the respective purchasers shall pay for each individual animal the price for which such individual was purchased plus the pro rata expense of purchasing and delivering the same, together with the said amount of .. per cent added thereto, and

WHEREAS it is proposed that in the distribution of such cattle to the respective purchasers thereof, the four, five, or six, or more persons to whom shall be allotted any particular car of such cattle shall draw numbers from one to four, five, or six, or more, as the case may be, the one drawing number one having first selection of one from the cattle contained in such car, the one drawing number two having second selection of

one, and so on, until each of such persons shall have selected one animal from the cattle contained in such car. This procedure shall be repeated until all the cattle in such car shall have been selected, each individual dropping out after having selected the number which he agreed to purchase.

NOW, THEREFORE, we, the undersigned, hereby agree upon the conditions hereinbefore set forth to purchase the number of cows or heifers set opposite our respective names, agreeing to take one, more or less, than such number if in the adjustment of the distribution it is necessary so to do, and further agreeing to take such cattle at either one or the other of the two places named opposite our respective names, further agreeing that upon being notified of the day on which such cattle are expected to arrive at the respective points to be on hand promptly to receive same and to make settlement therefor.

Name.	Number of cows or heifers.	To be delivered at—
.....	.....	.....
.....	.....	.....

The same general plan was carried out during the fall of 1912 with a group of farmers in southern Idaho. In that instance, three or four banks took up the work together, each agreeing to finance a carload of dairy stock.[1]

As a third example may be cited the work undertaken in a western Nevada community in the summer of 1913. Here the financial backers of a local creamery supplied the loans. The farmers gave indorsed paper together with mortgages on the stock purchased. The creamery withheld a part of the returns from milk and cream delivered, as shown in the following modified section of their agreement:

MODIFIED SECTION OF AGREEMENT.

THE UNDERSIGNED, jointly and individually, promise to pay to the ..... (Name.) Creamery the sum of ..... (Amount.) dollars, to be paid as follows: All butter fat produced by cows sold under this agreement to the undersigned shall be delivered to the ..... (Name.) Creamery at its plant at such times as said ..... (Name.) Creamery shall request, and that said ..... (Name.) Creamery may withhold one-half (½) the amount to be paid to us for cream and milk delivered; said amount to be applied upon the payment of the principal sum herein mentioned. Provided that said payment so made shall not be less than two and 50–100 ($2.50) dollars per month per cow, and if said amount is less than said amount per month per cow, the undersigned, jointly and individually, promise to pay said ..... (Name.)

[1] The Reclamation Service, Department of the Interior, the Office of Western Irrigation Agriculture, of the Bureau of Plant Industry of this Department, and private interests, have been fostering community organization for better credit facilities on certain reclamation projects, particularly in connection with the purchase of dairy stock on some of the northern projects, and for the commercial handling of cotton on some of the southwestern projects.

Creamery any deficiency so arising in cash to make up the sum of two and 50–100 ($2.50) dollars per cow per month on account of the principal sum herein mentioned. The undersigned, jointly and individually, further agree to pay to said ..... (Name.) Creamery interest at the rate of ..... (Rate.) per cent per annum, payable monthly, on all deferred payments.

Under this agreement, 491 cows and heifers were shipped in and distributed among 64 farmers. The loans made through the creamery amounted to $39,483.

These examples illustrate the way in which farmers in some sections have agreed upon a uniform and approved system of dairy improvement and how this has enabled them individually to secure the necessary credit from local banks on more favorable terms than usually prevail in this community. There are regions, however, where such arrangements are not sufficient to enable farmers as individuals to attract the necessary capital. Some additional security is necessary in addition to what each farmer is able to furnish.

PLAN II.

In the plan here described this additional security is supplied by having the farmers collectively assume a certain guarantee for the notes given by the members under the agreement. An illustration of how this has worked out is afforded on an irrigation project in southern Montana. Nineteen farmers organized an association and appointed trustees to represent the association in dealing with a local bank. The trustees were authorized to guarantee a limited amount to the bank on the joint and several liability of the association members. By adding this guarantee to the security offered by the individual farmers, the latter were able to secure the necessary capital for the purchase of two carloads of heifers which were shipped in from another State in August, 1913. The local bank placed $5,000 to the credit of the association at 8 per cent, whereas the general bank rate is 10 per cent or, more frequently, 12 per cent. In this instance, two men from the association were sent to make the purchase. After the stock had been secured, a proportionate share of all outlay, such as freight, travel and incidentals, was added to the purchase price of each animal, and charges were made accordingly. As in the illustration given from western Nevada, provision was made for the periodic payment of the loans out of the dairy products. The articles of agreement also provided that the purchaser should give the animals proper care and breed them only in such a manner as the trustees might approve. Such safeguards are a desirable feature of any contract of this kind. A portion of the articles of agreement, slightly modified, follows:

ARTICLES OF AGREEMENT.

WE, the undersigned, for the purpose of promoting the dairy industry on the ....., do hereby associate ourselves
(Name of project or locality.)
together under the name of ....., and do
(Name of association.)
hereby, each with the other, in consideration of the mutual benefits to be derived from such an association, and of the mutual covenants and agreements herein contained, agree as follows:

First. The business of this association shall be to buy and sell dairy stock and the products thereof and to assist the members hereof in getting a start in the dairy business.

Second. The management of the business shall be vested in a board of three (3) members who shall be known as trustees, and shall be elected by the majority vote of all members at the annual meeting as hereinafter provided.

Third. The trustees shall have the power for and in the name of the association to purchase not to exceed ..... milk cows or heifers at any one time and
(Number.)
not to exceed ..... bulls at any one time, said stock to be sold only to the
(Number.)
members, provided that any surplus stock may be sold to outside parties.

Fourth. For the purpose of obtaining funds necessary to purchase, care for, and deliver such cattle, including the expenses incident thereto, the trustees are hereby authorized to borrow funds upon such terms and conditions as they may deem best; and to this end such trustees are hereby made the agents of each person whose name is hereunto affixed, with full power to incur such obligations, the same to be the valid, joint, and several legal obligation upon each member of the association in the same manner as if each one personally signed and executed the same. Provided that in no event shall the total amount of the indebtedness thus created against the members of this association exceed the sum of ..... dollars
(Amount.)
at any one time. Such obligations shall be made in the name of the association and shall be signed by each of the trustees.

Fifth. Such cattle may be sold to the members on time and on such terms as the trustees may fix, in which event the purchasing member shall give a chattel mortgage on the cattle so purchased, together with their increase, to secure the unpaid purchase price, along with such other security as the trustees may agree upon; all such papers shall be transferred as security for any money borrowed by the trustees as herein provided. No sales shall be made to any person not a member of the association except for cash.

Sixth. Each person whose name is affixed hereto who may become indebted to the association on account of any such purchase hereby expressly agrees that he will take proper care of the cows obtained as herein described; that he will breed them only to such bulls as the trustees may approve; that the trustees shall have the option to purchase said cattle and their increase, in the event any member desires to sell, at the market price. It is further expressly agreed that if, in the judgment of the trustees, any member indebted to the association is not taking proper care of the cattle on which the association holds a lien or if such member shall violate any of the provisions of this agreement, then and in that event the trustees may take possession of said cattle and resell them, and out of the proceeds of such sale may first deduct the cost and expense incident thereto; second, the indebtedness due thereon to the association, and any sum remaining shall be paid over to such member.

Seventh. The annual meeting of the members shall be held on the ...., at which time the trustees shall be elected, who (Date.) shall hold office for one year or until their successors are elected. Each member shall be entitled to one vote at such meeting. The trustees shall make a full report at the annual meeting of all business done by them. Special meetings may be called by the trustees by giving three (3) days' notice to the members of the time and place of holding the meeting. Also special meetings of the members may be called by any five (5) members by giving the same notice. The trustees, or any one of them, may be removed from office at any special meeting by two-thirds (⅔) vote of all the members, at which time a successor or successors shall be elected to fill out the unexpired term of such trustee or trustees.

Eighth. The trustees shall be compensated for their services as agreed by the members in their annual meeting, funds for this purpose being raised by levying against each member in proportion to the number of cows owned.

Ninth. The trustees shall not have the power to incur any indebtedness other than as herein authorized or as may be authorized by a two-thirds (⅔) vote of all the members.

Tenth. The trustees shall elect one of their number as the chairman, one as treasurer, and one as secretary, who shall perform the duties incident to such offices.

Eleventh. This agreement shall continue in force for the period of three (3) years from and after the date hereof, provided it may be sooner dissolved by a two-thirds (⅔) vote of all the members if at the time the association is out of debt.

Twelfth. This agreement may be altered or amended at any regular or special meeting of the members by a two-thirds (⅔) vote of all the members.

Dated this ..... (Date.) day of ....., 191..... (Month.) (Year.)

Signed:[1] .....

.....

.....

PLAN III.

If, in place of the limited guarantee supplied by farmers themselves jointly, as described under Plan II, a similar guarantee from a third party be substituted, the essential features of Plan III will be the result. Such a plan was carried out in northwestern Wisconsin in the spring of 1913 and in northeastern Minnesota in the winter of 1914. The third party consisted of local business men who realized their common interest with the farmers in the general improvement of agricultural conditions in their territory. One agreement was made between the farmers and trustees appointed by bankers, and another agreement between the trustees and business men. The latter subscribed a certain percentage of the funds loaned, with the understanding that the money was to be a guarantee fund to protect the bankers. The first purchase made under this plan in northwestern Wisconsin included several carloads of dairy stock,

[1] The foregoing agreements make of the members either a partnership or a voluntary association, according to the statutes and court decisions of the State in which signed. It is suggested, therefore, that farmers desiring to enter into such agreements should secure the necessary legal advice.

the advances from the banks amounting to $9,475. One form of application and agreement made between the farmers and trustees under Plan III is given below:

APPLICATION AND AGREEMENT.

The undersigned hereby applies to..... (Names of trustees.) trustees appointed by the banks of..... (Locality.), for the loan of ..... (Amount.) dollars, or a sufficient sum to purchase.....cows. (Number.)

The cows are to be of..... (Name of breed.) and..... (Name of grade.)

The following is a true statement of the undersigned's resources and liabilities:

RESOURCES.		LIABILITIES.	
Description.....		Amount of indebtedness.....	$.....
Acres land cleared.....		To whom.....	
Value.....	$.....	.....	
Acres partly cleared.....		Nature of security.....	
Value.....	$.....	.....	
Acres wild.....			
Value.....	$.....		
Horses and cattle—Value.....	$.....		
Machinery.....	$.....		
Other resources.....	$.....		

THE UNDERSIGNED, FOR VALUE RECEIVED, hereby agrees to pay to said ....., trustees, or their order, on or before three years (Names of trustees.) from this date, the sum required to pay the entire cost of the cows purchased by him, with interest at 7 per cent per annum, on the unpaid principal, interest payable quarterly.

THE UNDERSIGNED FURTHER AGREES to sell all milk, cream, or butter produced, except the amount consumed by his own family, and cause to be paid to said trustees at stated intervals, each month, from the proceeds of said milk, cream, or butter, not less than three dollars ($3) per month for each cow purchased by him, until the aforesaid sum and interest is fully paid.

THE UNDERSIGNED FURTHER AGREES to breed the cows so purchased to a registered, pure-bred sire of the same breed as the cows so purchased, and to raise all the heifer calves.

THE UNDERSIGNED FURTHER AGREES to secure the payment of said sum and interest and the performance of this agreement, by a chattel mortgage to said trustees, upon the cows so purchased, and the following additional security:

.....

.....

THE UNDERSIGNED FURTHER AGREES to accept the cows that are purchased, and select the same in the following manner:

The cows shall be purchased by some person or persons to be designated by the above trustees or a committee appointed by the guarantors, and they shall buy grade Holsteins for those wanting such, and grade Guernseys for those wanting such, and heifers, either grade Holsteins or grade Guernseys, for those wanting heifers, and shall ship such cows and heifers to..... (Name of locality.) The Holstein cows shall each have a number on a card which shall be attached to the cows at....., (Name of locality).

showing the amount paid for each cow, together with her share of the freight and expense of purchasing all cows and heifers. Then numbers corresponding to the numbers on the cows shall be placed in a box and each farmer desiring to purchase a Holstein cow shall draw as many numbers from such box as the number of cows he desires to purchase, and take the cows which have a corresponding number on the cards attached to them and pay therefor the amount so fixed on the card.

The Guernsey grade cows shall be assigned in the same manner, also the Holstein grade heifers shall be assigned in the same manner, and also the Guernsey grade heifers shall be assigned in the same manner.

In case any cows or heifers are purchased in carload lots or less quantity for a lump um, then the person or persons so purchasing shall apportion the amount, so paid in lump, fixing a price to each cow.

Dated....., 191...

.....

In presence of:

.....

.....

PERMANENT ARTICLES OF AGREEMENT AMONG FARMERS: "THE COOPERATIVE CREDIT ASSOCIATION."

The cooperative credit association is not a new experiment. It has been tried out under varying conditions in different countries. A number of active associations in Canada and the United States attest its adaptability to American conditions. It is not essentially or even mainly an urban institution. Farmers have used it successfully and have reaped its benefits.

It is not the purpose of this paper to relate the history of cooperative credit associations. A great deal of published material is available bearing on the work of this type of organization. It is discussed under various names, including the Raiffeisen and Schulze-Delitzsch societies in Germany, the Luzzatti and Wollemborg types in Italy, the cooperative banks of Ireland, Austria, France, and Canada, and the credit unions of the United States. The aim of this bulletin is rather to point out where the need for such an association may be said to exist, what the essential features of the organization are, and what advantages to the farmer may be gained from it.

NEED FOR A COOPERATIVE CREDIT ASSOCIATION.

There are many farmers who realize the importance of improving their equipment and farming methods, but who lack the capital required to make the desired change. At the same time, the terms on which they may be able to borrow the necessary funds are not such as to encourage the use of a loan. Their honesty and industry may be unquestioned, nevertheless their individual security does not command the desired confidence. Where a group of neighboring farmers are thus similarly situated, a cooperative credit association may supply the needed additional security by placing the collective good will of the group behind each of the members. The use of a collective guarantee as applied to a particular undertaking has already been described under Plan II, earlier in this bulletin. In a cooperative credit association, however, collective security is available continuously for such purposes as may be approved by the association. The association also provides for the accumulation and use of local savings, affords training in business habits and procedure, supplies a collective fund for common agricultural purposes, and renders service to its members in other ways, which are not contemplated in the plans previously described.

It is very unfortunate that farmers who suffer from the limitations of their individual personal credit should not take advantage of the benefit of such collective good will. One of the most widespread forms of economic waste among farmers arises from failure to utilize the power of confidence and good will among neighbors. Of course, where conditions are such that neighbors do not trust each other and refuse to cooperate, it is futile to speak of collective power. On the other hand, where farmers are willing to take advantage of the added good will which a neighborly attitude affords, a cooperative credit association proves a helpful agency in promoting the increase of available capital and in strengthening the borrowing capacity of individuals.

The reader may ask why the farmer as a member of a credit association can command confidence and resources which are denied him as an individual. To answer this, it is necessary to show what services a credit association may render each member. Perhaps this can be done best by first explaining how credit associations are organized.

HOW TO ORGANIZE AN ASSOCIATION.

In organizing a cooperative credit association careful study should be given the various features to be embodied in its articles of agreement and by-laws. Proper provision should be made in regard to membership, voting power, the securing of funds, the making of loans, and the necessary officers and committees. In States where cooperative laws are not complete, the association may be organized only as a partnership or voluntary association.

MEMBERSHIP.

The membership of the association should be limited to individuals who live so near together that all are personally acquainted with one another and can keep in touch with one another's work. This makes it necessary to limit the territory to a relatively small area, such as a township or a district. The membership should be restricted also to individuals with industrious habits and of good moral character.

VOTING POWER.

Where such associations are organized without capital stock each member has usually one vote. If ownership of share capital is required for membership and State laws require that voting power be determined according to shares owned, the danger of allowing a few individuals to gain control may be lessened by limiting the number of shares to be held by each individual or by limiting the voting power of any member to a certain percentage (say 10 per cent) of the total vote.

HOW TO SECURE FUNDS.

The funds of the association may be secured through share capital, through deposits, and by borrowing. If share capital is provided, the shares usually are issued in small denominations ($5 is a customary amount) and should be withdrawable at any time. Each member is then required to purchase at least one share. Wherever share ownership is required, payment should be permitted in small installments in order not to deprive anyone of membership. The installment plan of payment also has the advantage that it stimulates the habit of saving among members and encourages the establishment of a reserve fund to protect the financial position of the association. Under proper legal authority a credit association may accumulate funds in the form of deposits. Such deposits should be received at any time, and their accumulation should be encouraged by the payment of a suitable rate of interest and with the option of withdrawal whenever desired, or on thirty days' notice. If the plan is to organize a voluntary association or partnership, care should be taken to note limitations imposed by law bearing on deposit business. Within limits to be determined by the members of the association, if not already fixed by statute, provision also should be made so that the association may borrow money.

HOW TO MAKE LOANS.

As already stated, the main functions of a credit association are to encourage habits of saving, to afford training in business methods, to establish a collective fund for common agricultural purposes, and to provide loans to the members on reasonable terms. The usefulness of the latter function, however, depends upon how it is conducted. In no instance should a loan be granted unless the committee deems it to be productive or for a provident purpose, and believes that the member and the association will be benefited by the loan. Loans should be restricted to members and made only in limited amounts. Generally it has been found unwise to make any loan to officers or members of the standing committees, except by majority vote at members' meetings. A maximum interest rate, as well as a maximum term, should be fixed for all loans, depending upon the economic condition of the locality. Members should be taught to pay all their obligations promptly. Careful attention should be given both to the methods and personnel of the management, in order to insure businesslike procedure in the affairs of the association.

HOW THE ASSOCIATION IS MANAGED.

Authority with reference to the affairs of the association is generally distributed between member meetings, properly convened, and certain committees or boards. The latter usually consists of a

board of directors or managers and a supervisory committee and may include an outside auditor.[1] A separate credit committee may be appointed to perform certain functions otherwise delegated to the board of directors.

The general management of the affairs of the association is usually vested in the board of managers, which controls the admission and expulsion of members. The board passes on requests for loans unless such work is assigned to a special committee. In some countries the board serves as an arbitration tribunal for members who are dissatisfied with the action of other officials. Other officers, such as president, vice president, secretary, and treasurer or manager, are selected from the members of the board and discharge the duties ordinarily associated with their positions.

COMMITTEES ON LOANS AND AUDITING.

When a separate credit committee is provided to pass on all requests for loans, that committee is vested with responsibility for the solvency of the association. To safeguard its work, it is often customary to require that all its actions be taken by unanimous consent. In some cases it is the practice not to allow any of the members to be chosen from the general board. This is done in order that the committee may examine with an open mind and with great care the applications for loans and not be influenced by the findings made in connection with admission to membership. Such a requirement is found in the Massachusetts and Wisconsin laws. In New York, however, the recently enacted law for credit unions specifically states that this committee may be selected from the membership of the board. The supervisory committee is in general charge of the examining and auditing of accounts. It also represents the association when the latter is not in session. As a rule, all officers serve without pay. The only exception is when a small salary is paid the treasurer or manager.[2]

HOW THE ASSOCIATION HELPS ITS MEMBERS.

A credit association may render service to its members in several ways: First, in furnishing the incentive and facility for saving and local investment; second, in furnishing the advantages of training in business methods and habits; third, in furnishing the opportunity and in giving the assistance necessary to borrow to advantage; fourth, in accumulating a collective fund for common agricultural purposes.

---

[1] In some foreign countries the credit associations are affiliated in unions whose functions include the auditing of accounts for the local organizations.

[2] Valuable suggestions as to organization and management of credit unions may be found in the following:

Massachusetts Bank Commissioner. Credit unions. Boston, 1911.

Ham, Arthur H., and *Robinson, Leonard G.* A credit union primer. New York, Russell Sage Foundation, 1914.

THE STIMULATION TO SAVING.

In many communities there is considerable waste, either because funds are permitted to lie idle or because money is spent heedlessly through lack of a suitable incentive for saving. To remedy such evils, it is not only necessary to appreciate the superior advantage of habits of economy, but also to have at hand an agency to which it will seem worth while for the individual to bring his money, rather than to spend it or allow it to lie idle. The credit association furnishes just such an agency conveniently at hand, where a member may come at his convenience and deposit even trifling sums of money. Moreover, such an advantage is not necessarily limited to adults. In a large number of credit unions in Massachusetts, the main purpose of organization has been to establish an institution that would stimulate thrift among children. In some of these unions half of the capital account is held in this way and has been brought together by the accumulation of very small sums of money, until some of these children's deposits amount to as much as $50 or more. In order to offset to some extent the influence of a large number of institutions about us that appeal constantly to the spending habits of young and old, it would seem worth while to supply an agency that appeals to the homelier yet more enduring virtues of thrift and economy. Moreover, it may be added that the advantage of being able to borrow is no advantage at all, unless the individual has first demonstrated some ability to save.

The advantages of such an association ought to be considered from the standpoint of the interest of the community also. Not only is the community's stock of capital enlarged by the increased savings, but the funds are employed locally to build up the community instead of being sent away for the benefit of other regions. In this connection, it should be stated that a cooperative credit association does not displace other banking institutions, but rather tends to supplement and enlarge their work. Its deposits are generally in such small amounts as would not accrue to other banks directly. On the other hand, the funds not loaned to members are deposited with other banks.

THE TRAINING IN BUSINESS METHODS.

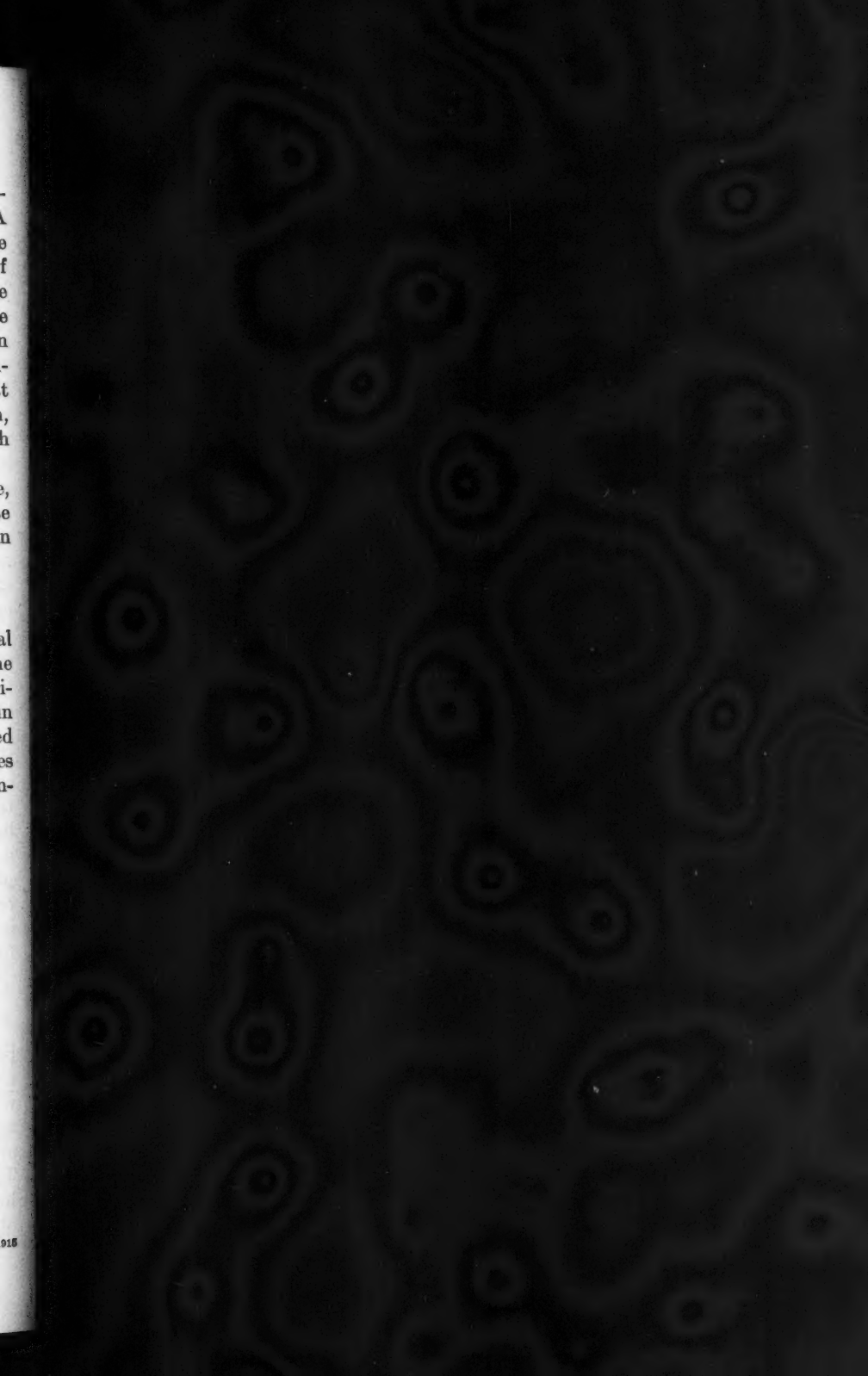
Every member of such an association derives important business benefits. He gains the advantage of an open account. This supplies a fund that can be drawn on at any time to meet temporary needs, while the unused balance yields the owner a moderate rate of interest. Again, the farmer is brought into contact with bank statements and accounts and becomes familiar with commercial forms and practices. The use of these improved facilities in exchange also reveals the importance of accuracy and promptness in dealing with credit obligations.

THE SUPERVISION OF LOANS.

The loan service of a credit association is twofold: It affords an opportunity to borrow to advantage and discourages unwise borrowing. A member is able to secure a loan of the desired amount at a reasonable rate and for such a time as may be necessary in view of the purpose of the loan. The work of the credit association also consists to a large extent in so directing the use of the borrowing privilege that it will be applied to productive purposes, and to productive purposes only. In other words, it is the function of such an association to restrain members from contracting unwise loans, as well as to encourage those that are productive. This can be accomplished in the local association, where the members know each other and can watch the uses to which the loans are devoted.

The restraining influence of neighbors' watchfulness is, of course, prompted by the fact that all are financially interested in a safe use of the money. This very watching safeguards the returns of a loan and insures added security to the loan agency.

THE USE OF A COLLECTIVE FUND.

The services already discussed apply more particularly to individual members. Such an association may also be of direct service to the whole group by affording the use of a collective fund for common agricultural purposes. This function has been especially important in certain foreign countries, where collective purchasing is conducted largely with the aid of the credit association. All of these services aid the farmer as a member of a credit association to command confidence that may be denied him as an individual.

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1915